MASS. MP03.2: M45/v.2

UMASS/AMHERST
312066 0278 0724 0

CTPS TECHNICAL REPORT

46

MBTA SYSTEMWIDE PASSENGER DATA COLLECTION PROGRAM VOLUME 2: BUS SYSTEM

GOVERNMENT DOCUMENTS COLLECTION
OCT 01 1984
University of Massachusetts Depository Copy

July 1984

CTPS TECHNICAL REPORT 46

TITLE MBTA Systemwide Passenger Data Collection Program
Volume 2 - Bus System

AUTHOR(S) Michael Carakatsane (Project Manager)

DATE July 1984

ABSTRACT Results of the rapid-transit-system portion of the 1978 Systemwide Passenger Data Collection Program of the MBTA were presented in CTPS Technical Report 26, MBTA Systemwide Passenger Data Collection Program, Volume 1 - Rapid Transit System. Bus-system results are summarized in this volume, which completes the set. The report (1) describes the bus system in 1978, (2) gives a general description of the procedures used to collect and process the data, (3) gives boardings for the peak periods and total day for all routes, (4) summarizes socioeconomic characteristics of bus system passengers, and (5) presents travel characteristics of bus passengers.

Several memoranda are on file at CTPS which provide more detailed information about the survey, its results, and the processing that produced those results. Also on file are the processed survey results, which can be used to produce more detailed analysis than that included here and in Technical Report 26.

This document was prepared by **CENTRAL TRANSPORTATION PLANNING STAFF**, an interagency transportation planning staff created and directed by the Metropolitan Planning Organization, consisting of the member agencies.

Executive Office of Transportation and Construction
Massachusetts Bay Transportation Authority
Massachusetts Department of Public Works
MBTA Advisory Board
Massachusetts Port Authority
Metropolitan Area Planning Council

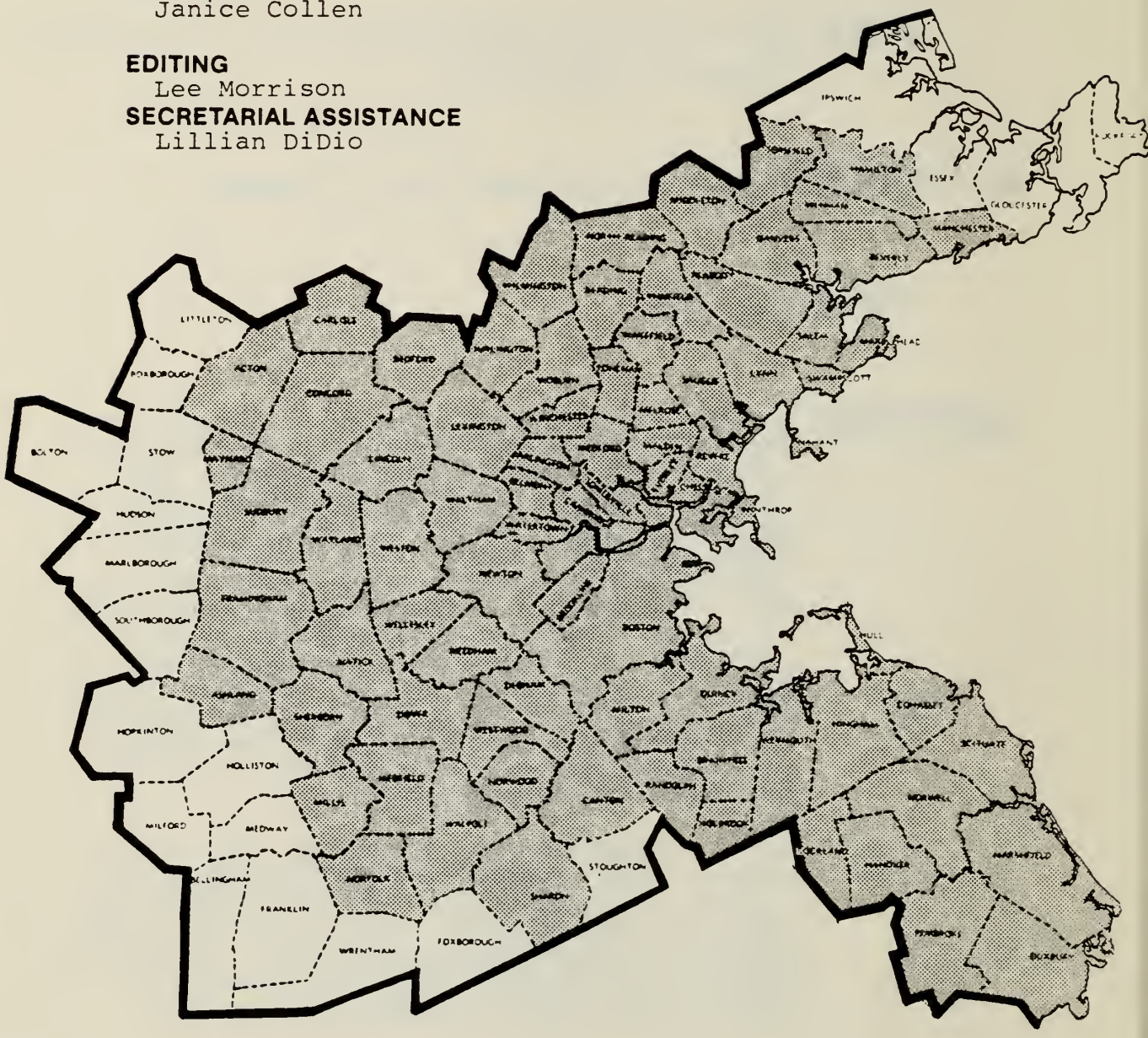
PREPARED FOR THE BENEFIT AND USE OF THE MUNICIPALITIES CONSTITUTING THE BOSTON METROPOLITAN AREA PLANNING DISTRICT

AUTHOR(S)
Michael Carakatsane,
Project Manager

GRAPHICS
Janice Collen

EDITING
Lee Morrison

SECRETARIAL ASSISTANCE
Lillian DiDio



The project reported on in this document was financed by the technical study grants cited below from the Urban Mass Transportation Administration of the U. S. Department of Transportation, and with state and local matching funds.

Grants MA-09-0040, MA-09-0051, MA-09-0063, MA-09-0076, MA-09-0084, MA-09-0095, and MA-09-0107

Copies may be obtained from the State Transportation Library, Ten Park Plaza, 2nd floor Boston, MA 02116

TABLE OF CONTENTS

LIST OF EXHIBITS v

ACKNOWLEDGMENTS xi

I. INTRODUCTION 1

A. Background and Purpose 1

B. Description of the Bus System 1

1. Service 3
a. North Shore Corridor 3
b. Northern Corridor 3
c. Northwestern Corridor 7
d. Western Corridor 7
e. Southwest Corridor 7
f. South Shore Corridor 7
g. Core Area 12

2. Fares 12

II. DATA COLLECTION AND REDUCTION PROCEDURES 19

A. Synopsis 19

B. Field Data Collection 20

1. Passenger-Count Data 22
a. Purpose of Boarding Counts 22
b. Method of Data Collection 22

2. Passenger Questionnaire-Survey Data 25
a. Purpose of the Questionnaire Survey 25
b. Method of Data Collection 25

C. Data Reduction 30

1. Passenger-Count Data Cleaning 30
2. Passenger-Count Data Expansion 30
3. Questionnaire-Survey Data Cleaning 31
4. Questionnaire-Survey Data Expansion 31

III. PASSENGER-COUNT RESULTS 35

A. Introduction 35

B. Systemwide Results 35

C. Analysis of Boarding Data 38

1. Boardings by Garage 38
2. Boardings by Time of Day 38
3. Selected Rankings of Bus Routes 43
4. Arrival Rates 59

D. Boardings by Route 67

E. On/Off Data for Each Route 67

IV. PASSENGER QUESTIONNAIRE-SURVEY RESULTS 83

A. Introduction 83

B. Socioeconomic Characteristics of Passengers 83

1. Systemwide Summary of Socioeconomic Characteristics of Passengers 83
2. Age 84
3. Sex 93
4. Occupation 93
5. Household Size 93
6. Household Income 99
7. Auto Ownership 104

C. Travel Characteristics of Passengers 104

1. Systemwide Summary of Travel Characteristics of Passengers 104
2. Trip Purpose 104
3. Fare Payment Method 108
4. Frequency of Usage 116
5. Mode of Access 125
6. Mode of Egress 125
7. Bus/Rail Analysis 125

LIST OF EXHIBITS

I-1	MBTA Bus Service Area	2
I-2	Garage Service Areas	4
I-3	North Shore Corridor	5
I-4	Northern Corridor	6
I-5	Northwestern Corridor	8
I-6	Western Corridor	9
I-7	Southwestern Corridor	10
I-8	South Shore Corridor	11
I-9	Core Area	13
I-10	Boston Proper	14
I-11	1978 MBTA Transit Passes	17
II-1	Surveyor's Assignment Sheet	21
II-2	1978 Survey B-1 Form	23
II-3	1978 Survey B-2 Form	24
II-4	Bus Questionnaires Distributed Versus Returned and Boardings by Garage (Table)	26
II-5	Bus Questionnaires Distributed Versus Returned and Boardings by Garage (Graph)	27
II-6	Scheduled Trips Covered in Questionnaire Survey by Season	28
II-7	1978 Survey Questionnaire	29
II-8	Arrival Rate Plot for Route 1	32
III-1	Distribution of Bus Ridership by Hour of the Survey Day	36

III-2	Time Distribution of Bus Riders	37
III-3	Distribution of Boardings by Garage	39
III-4	Distribution of Buses Run, Boardings and Revenue by Garage	40
III-5	Boardings and Revenue per Bus by Garage	41
III-6	Comparison of Bus and Rail Riderships by Hour of the Survey Day	42
III-7	Bus Routes Ranked by Number of Buses Run in Both Directions for the Complete Survey Day	44
III-8	Bus Routes Ranked by Number of Buses Run in Both Directions AM Peak Period	46
III-9	Bus Routes Ranked by Number of Buses Run in Both Directions PM Peak Period	48
III-10	Bus Routes Ranked by Number of Buses Run in Each Direction for the Complete Survey Day	51
III-11	Bus Routes Ranked by Number of Buses Run in Each Direction AM Peak Period	53
III-12	Bus Routes Ranked by Number of Buses Run in Each Direction PM Peak Period	54
III-13	Bus Routes Ranked by Number of Boardings in Both Directions for the Complete Survey Day	55
III-14	Bus Routes Ranked by Number of Boardings in Both Directions AM Peak Period	56
III-15	Bus Routes Ranked by Number of Boardings in Both Directions PM Peak Period	57
III-16	Bus Routes Ranked by Number of Boardings in Each Direction for the Complete Survey Day	60
III-17	Bus Routes Ranked by Number of Boardings in Each Direction AM Peak Period	61

III-18	Bus Routes Ranked by Number of Boardings in Each Direction PM Peak Period	62
III-19	Bus Routes Ranked by Number of Passengers per Bus in Both Directions for the Complete Survey Day	63
III-20	Cash Revenue of the Twenty-five Most Patronized Routes	65
III-21	Arrival Rate Plot for Route 15	66
III-22	Boardings and Bus Runs by Route and Direction AM and PM Peak Periods and Complete Day	68
III-23	Peak Load Information for the Twenty-five Most Patronized Routes	81
IV-1	Comparison of Age Distributions Including Respondents Under 16 Years Old Rail and Bus Surveys and Boston SMSA	85
IV-2	Comparison of Age Distributions Without Respondents Under 16 Years Old Rail and Bus Surveys and Boston SMSA	86
IV-3	Distribution of Riders by Age by Garage (Graph)	87
IV-4	Distribution of Riders by Age by Garage (Table)	88
IV-5	Distribution of Riders by Age by Route Class (Graph)	89
IV-6	Distribution of Riders by Age by Route Class (Table)	90
IV-7	Distribution of Riders by Age by Time Period (Graph)	91
IV-8	Distribution of Riders by Age by Time Period (Table)	92
IV-9	Comparison of Distributions by Sex for Rail and Bus Surveys and Boston SMSA	94
IV-10	Distribution of Riders by Sex by Route Class	95

IV-11	Distribution of Riders by Sex by Time Period	96
IV-12	Comparison of Occupations for Persons Over 16 Years Of Age for Rail and Bus Surveys (Graph)	97
IV-13	Comparisons of Occupations With and Without Persons Over 16 Years of Age for Rail and Bus Surveys and Boston SMSA (Tables)	98
IV-14	Comparison of Distributions by Household Size for the Bus and Rail Surveys and the Boston SMSA	100
IV-15	Comparison of Distributions by Household Income for the Bus Survey and the Boston SMSA	101
IV-16	Distribution of Riders by Household Income by Route Class (Graph)	102
IV-17	Distribution of Riders by Household Income by Route Class (Table)	103
IV-18	Comparison of Automobile Ownership between the Bus Survey and the Boston SMSA	105
IV-19	Rate of Driver's-License Possession Among Riders	106
IV-20	Distribution of Riders by Trip Purpose	107
IV-21	Distribution of Riders by Trip Purpose by Route Class (Graph)	109
IV-22	Distribution of Riders by Trip Purpose by Route Class (Table)	110
IV-23	Distribution of Riders by Trip Purpose by Time Period (Graph)	111
IV-24	Distribution of Riders by Trip Purpose by Time Period (Table)	112
IV-25	Distribution of Riders by Trip Purpose by Garage (Graph)	113
IV-26	Distribution of Riders by Trip Purpose by Garage (Table)	114
IV-27	Distribution of Riders by Fare Paid	115

IV-28	Distribution of Riders by Fare Paid by Route Class (Graph)	117
IV-29	Distribution of Riders by Fare Paid by Route Class (Table)	118
IV-30	Distribution of Riders by Fare Paid by Time Period (Graph)	119
IV-31	Distribution of Riders by Fare Paid by Time Period (Table)	120
IV-32	Distribution of Riders by Frequency of Bus Use (Table)	121
IV-33	Distribution of Riders by Change in Frequency of Bus Use	122
IV-34	Distribution of Riders by Frequency of Bus Use by Trip Purpose (Graph)	123
IV-35	Distribution of Riders by Frequency of Bus Use by Trip Purpose (Table)	124
IV-36	Distribution of Riders by Frequency of Bus Use by Route Class (Graph)	126
IV-37	Distribution of Riders by Frequency of Bus Use by Route Class (Table)	127
IV-38	Comparison of Distribution of Riders by Mode of Access Bus and Rail Surveys	128
IV-39	Distribution of Riders by Mode of Access by Route Class (Graph)	129
IV-40	Distribution of Riders by Mode of Access by Route Class (Table)	130
IV-41	Distribution of Riders by Mode of Egress	131

ACKNOWLEDGMENTS

This report was given a great deal of effort by a number of individuals who all deserve many thanks.

Of those outside CTPS, we wish in particular to thank Rocco Mancini, Donald Kidston, and Alan Castaline, all of the MBTA; John Attanucci and Katherine O'Neill, of the MBTA at the time; Barry Faulkner and Thomas J. Humphrey, then of EOTC; Lawrence Tittemore of Tittemore Associates; and Paul Holland, Chief Statistician of Educational Testing Services, Princeton, New Jersey.

The Project Manager, Michael Carakatsane, was fortunate to have the assistance of the following current CTPS employees: Demitrios Athens, Daniel Breeding, Janice Collen, Francis Fleming, Ian Harrington, Leland Morrison, David Sarota and Alicia Wilson. Former CTPS staff members who deserve special thanks are: Talal Abi-Karam, Hamid Aminian, Dominic Anidi, Martin Baratz, Kenneth Carter, Polly Grunfeld, Rafie Majzoubi, Nima Mansour, Assad Mawaad, Manuel Rodriguez, Richard Rousseau, Alexander Sopyla, Michael Tsang, Karen Weiner, and David Wilcock.

I. INTRODUCTION

A. Background and Purpose

Knowledge and understanding of the character and needs of persons in the marketplace has been central to modern business management's ability to be effective and efficient in the provision of goods and services. Seventy-nine communities surrounding Boston compose the marketplace that depends upon the Massachusetts Bay Transportation Authority for public transportation service. In 1978, the Authority commissioned a survey of its passengers to gather information that would help it provide better service now and in the future. A comprehensive survey of passenger characteristics had not been done since the Postcard Survey of the Traffic and Transportation Inventory of 1963-1964.

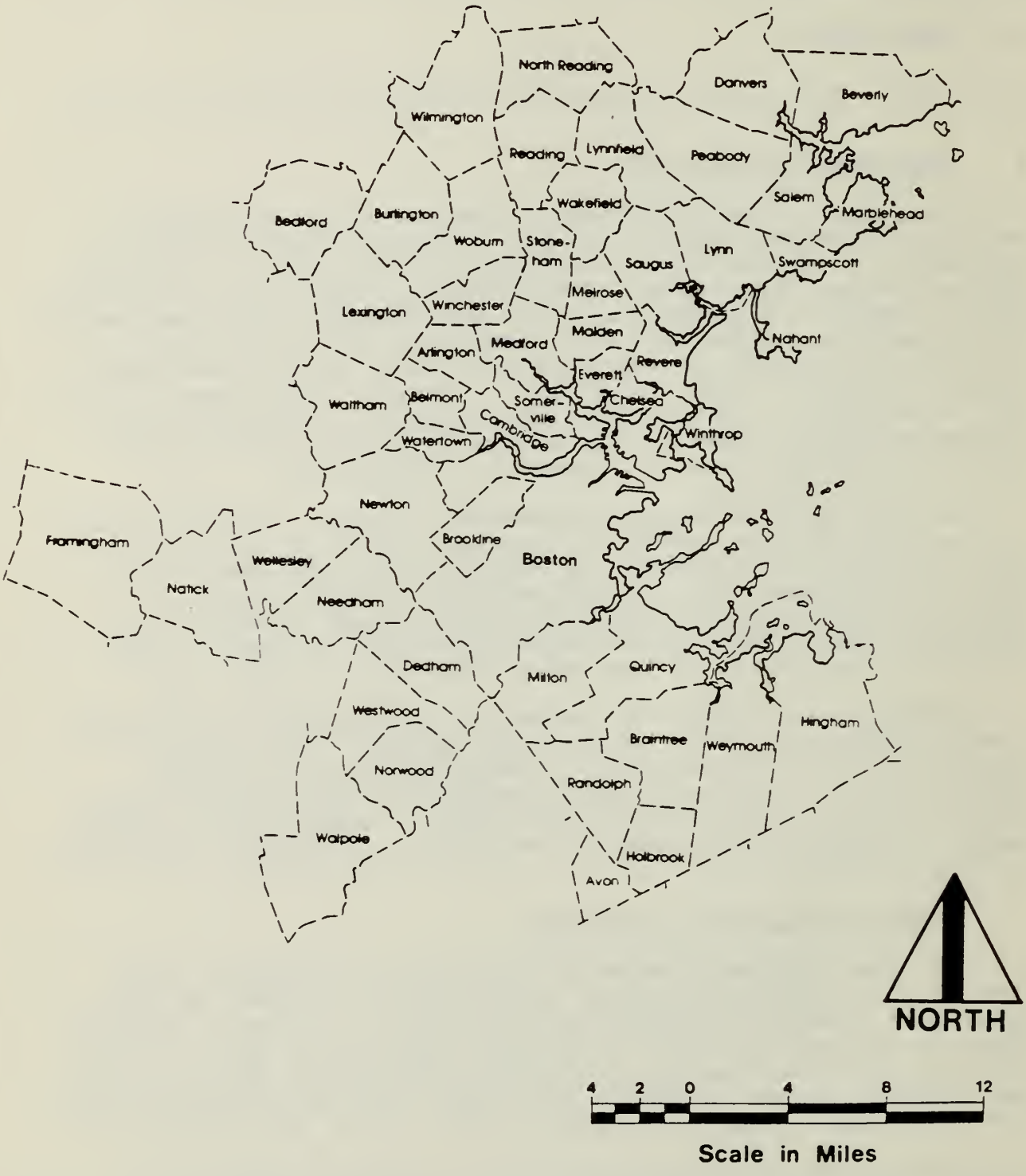
The 1978 program surveyed passengers on both the rapid transit and the bus portions of the system, gathering information about the volume of passengers, revenue collected, and the trip-making and socioeconomic characteristics of the ridership. Similiar information had been collected for the commuter rail system in 1976. The 1976 and 1978 data form the basis for an update to the profile of passengers made over 15 years ago.

CTPS Technical Report 26 presented the results of the rapid-transit portion of the 1978 Passenger Survey. This volume reports on the bus system and is compatible with the rapid-transit report. The two reports present the bulk of the information that was extracted from the survey. More details of the survey, its processing, and its results are provided in memoranda on file at CTPS.

B. Description of the Bus System

There were 208 bus routes in the MBTA bus system in 1978, running in 48 communities (see Exhibit I-1). A route can sometimes have several variations in the path over which it travels. These variations are run at different times of the day for scheduling or technical reasons or to allow the MBTA to better serve the public. In the spring of 1978 there were 434 different paths over which MBTA buses traveled, counting all of the variations.

There are many criteria which can be used to group bus routes. Each has its advantages. As a practical matter, the categorization of routes is never unambiguous. Many routes can be placed in more than one category, because their attributes are varied. For example, buses that feed a rapid-transit station also provide local circulation in a community. Should they be classified as feeder service or local service? This report uses a number of classifications, which are described here.



MBTA Bus Service Area

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit I-1

The MBTA groups routes by six rating stations, according to where the buses are garaged (see Exhibit I-2). Garage location in turn depends upon where the route is located, what garages have storage space available, who may have operated the route prior to the MBTA, and other factors. Rating-station assignment will be used later in the report to present results geographically, because garage was reported on each data record during processing, making this the easiest criterion for geographic categorization. There is overlapping among rating-station areas, as shown in Exhibit I-2, especially in Boston Proper, but this problem is outweighed by ease of use in other respects.

Classification of routes into urban, suburban and express bus also facilitated the presentation of survey results. However, the many buses traveling radially between low-density and high-density areas presented problems in making this classification. Such routes were assigned the density category that best described the concentration of passengers along the largest segment of the route length.

The description of 1978 routes that follows groups them by regional travel corridor. This categorization system, too, is not without cases of ambiguity, since some routes travel between corridors. These have been included in the description of the area in which they collect passengers during the morning peak period.

1. Service

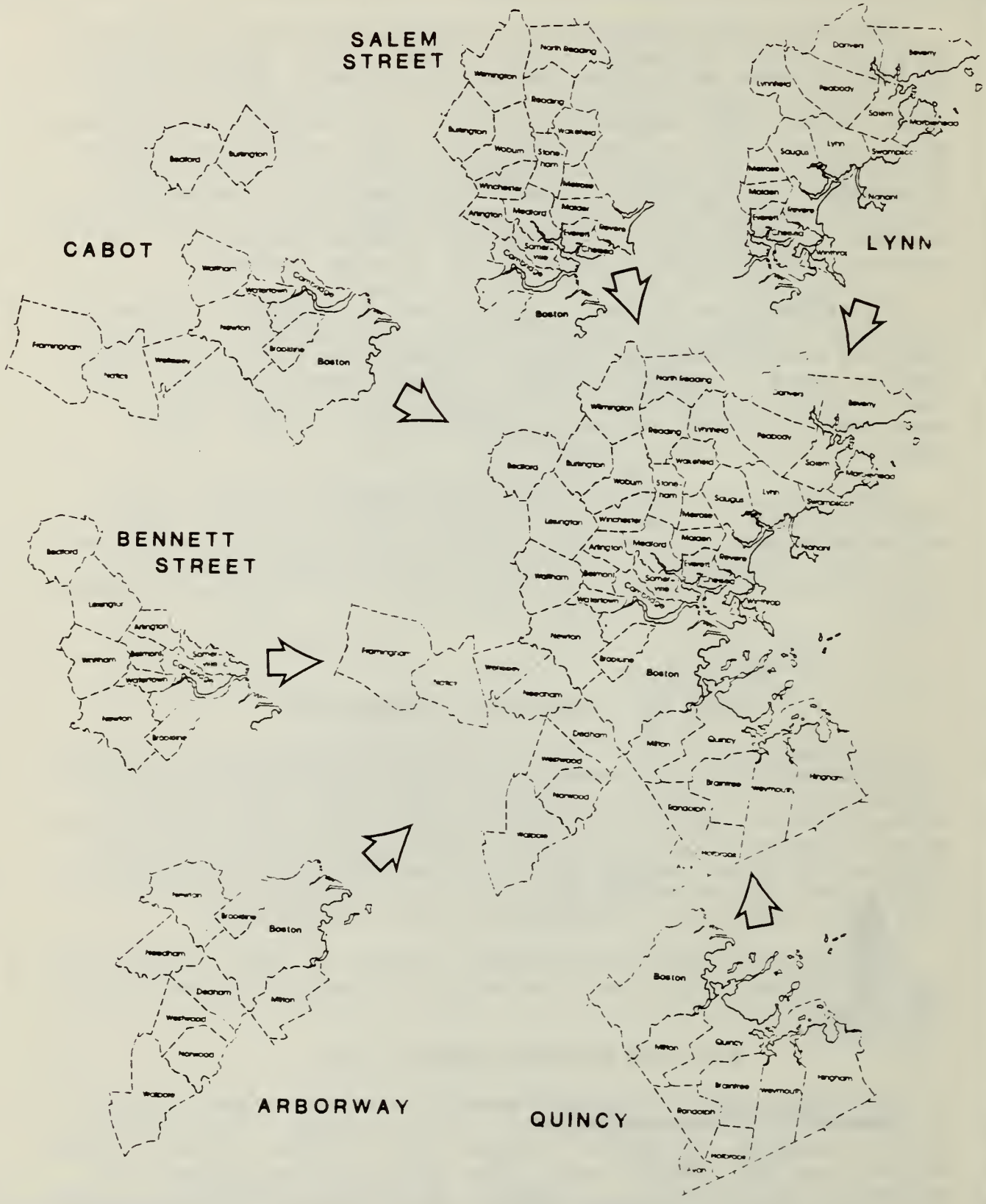
a. North Shore Corridor (Exhibit I-3)

Line-haul service in this corridor is provided by Blue Line rapid transit from Revere to Boston and the Gloucester Branch of the commuter rail system. Bus passengers from Revere and the eastern part of Malden fed Wonderland Station, the northern terminus of the Blue Line. Central Square in Lynn served as the focal point of bus routes from Lynn, Swampscott, and Nahant. Further out, Salem Center also served as a terminus and collection point for trips from Danvers, Salem, and Beverly.

Express bus service from Central Square in Lynn to Boston via Saugus provided a line-haul bus service to Boston for many North Shore residents.

b. Northern Corridor (Exhibit I-4)

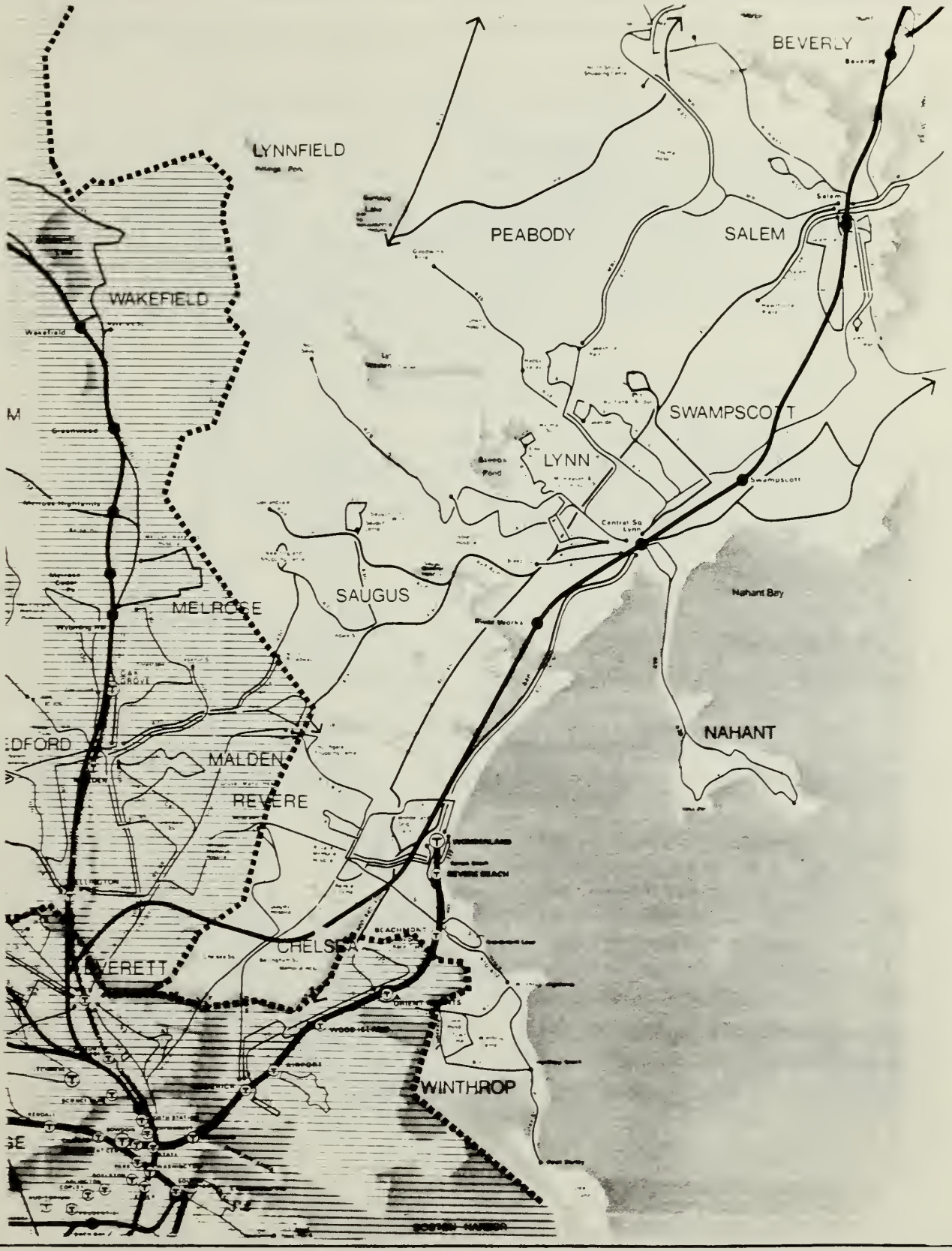
Wellington Station of the Orange Line rapid-transit service is located at the southern end of this corridor. Routes from Malden, Medford, and Woburn stopped there to send trips to Boston on the line-haul leg of their trip. Other Malden routes terminated at Malden Center. Reading, Wakefield, and Woburn routes also terminated at Malden Center, although they stopped at Oak Grove Station on the Orange Line.



Garage Service Areas

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

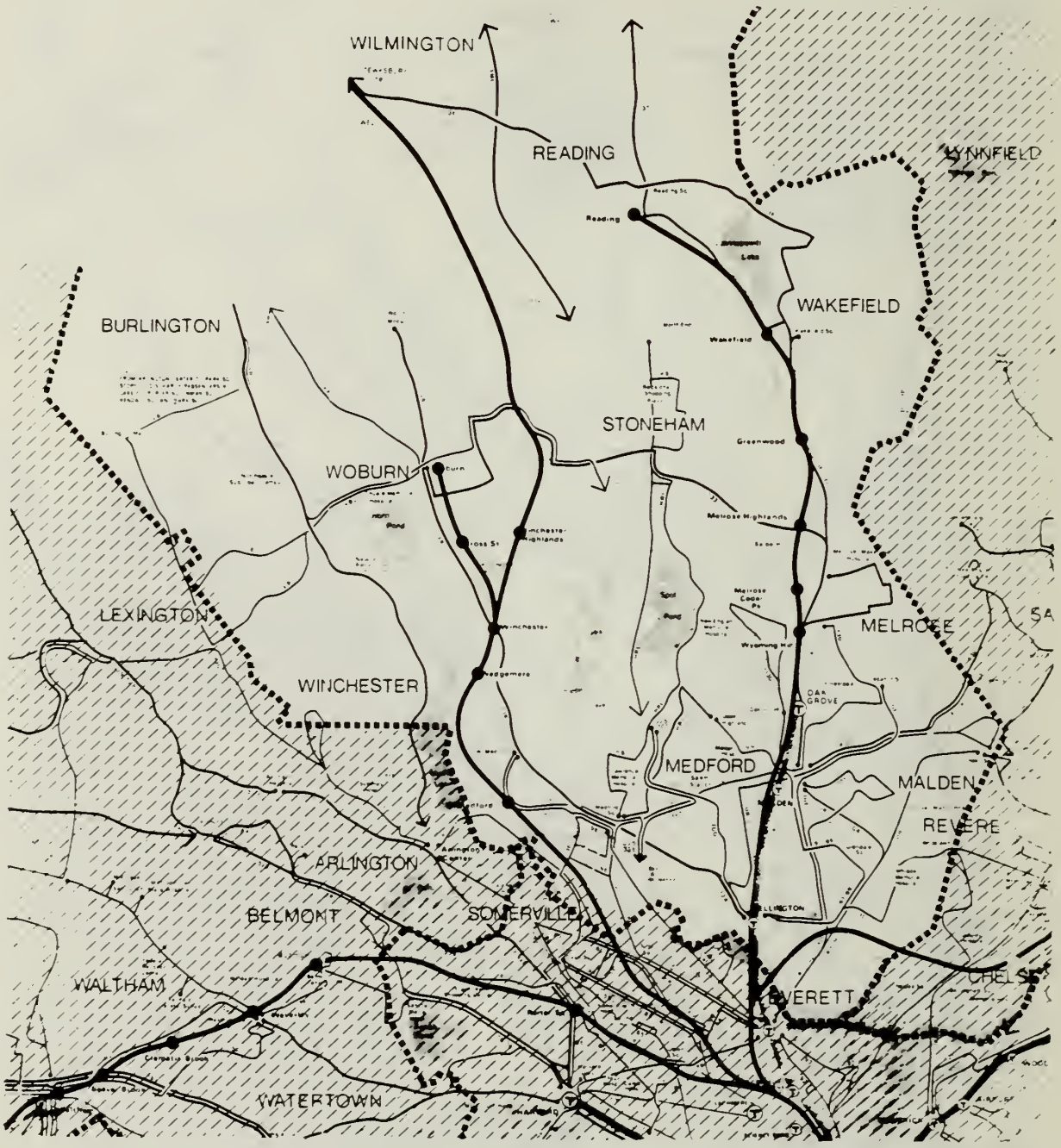
Exhibit I-2



North Shore Corridor

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit I-3



Northern Corridor

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit I-4

Closed-door express service to Boston was provided to riders in Medford, Winchester and Woburn.

c. Northwestern Corridor (Exhibit I-5)

This corridor has a branch of the commuter-rail system going to Fitchburg through its center. Two other major transportation facilities just outside the area have impacts on the area's service: the Massachusetts Turnpike and the Harvard Square Red Line station. Radial routes traveled through Bedford, Belmont, Waltham, Watertown, Lexington, and Arlington to connect with rapid transit at Harvard Square. Express service was operated to Haymarket Square in Boston from Watertown Square. Circumferential service ran from Waltham to Lexington.

d. Western Corridor (Exhibit I-6)

Local service was provided for Wellesley and Newton in this corridor. Line-haul connection points to Boston were provided by the Green Line's Riverside Branch and the Framingham Branch of the commuter rail system. Additional connections lay just outside the corridor at the end of the Boston College and Cleveland Circle Green Line branches.

The Massachusetts Turnpike provided the route for express bus service from Waltham to Boston via Newton.

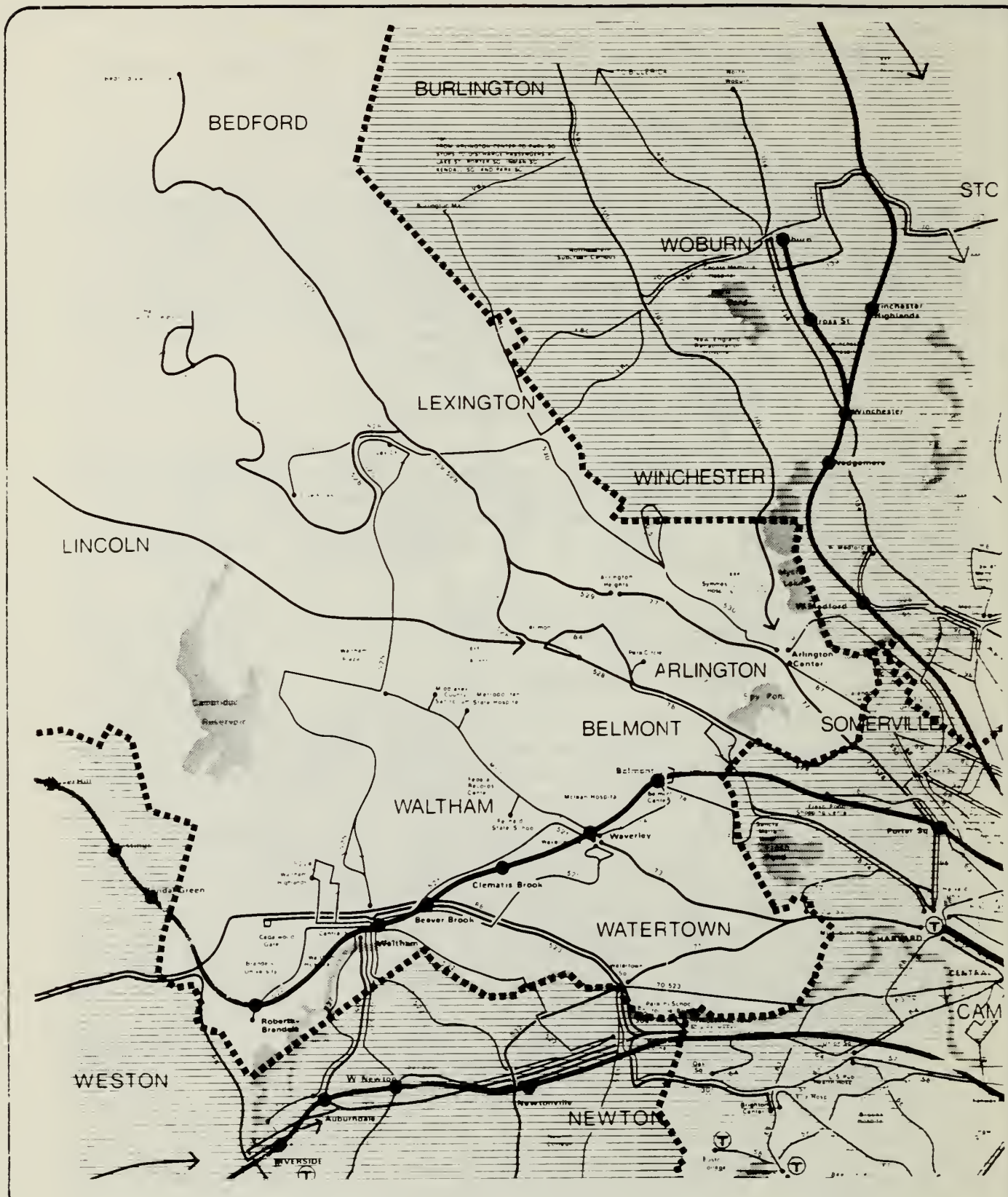
e. Southwest Corridor (Exhibit I-7)

Major public transportation service was provided in this corridor by commuter rail. The Needham, Franklin, and Providence branches all pass through the corridor. Some bus service in the corridor was provided by private carriers.

Several variations of Route 34 traveled from Dedham to Forest Hills Station at the southern end of the Orange Line. One of these lines was Route 34E, which traveled from the East Walpole town line to Forest Hills Station. Another MBTA route ran from just inside the eastern edge of the corridor northeastward to the Mattapan trolley line. Still another route traveled between Needham and Watertown in a circumferential path crossing into the next corridor.

f. South Shore Corridor (Exhibit I-8)

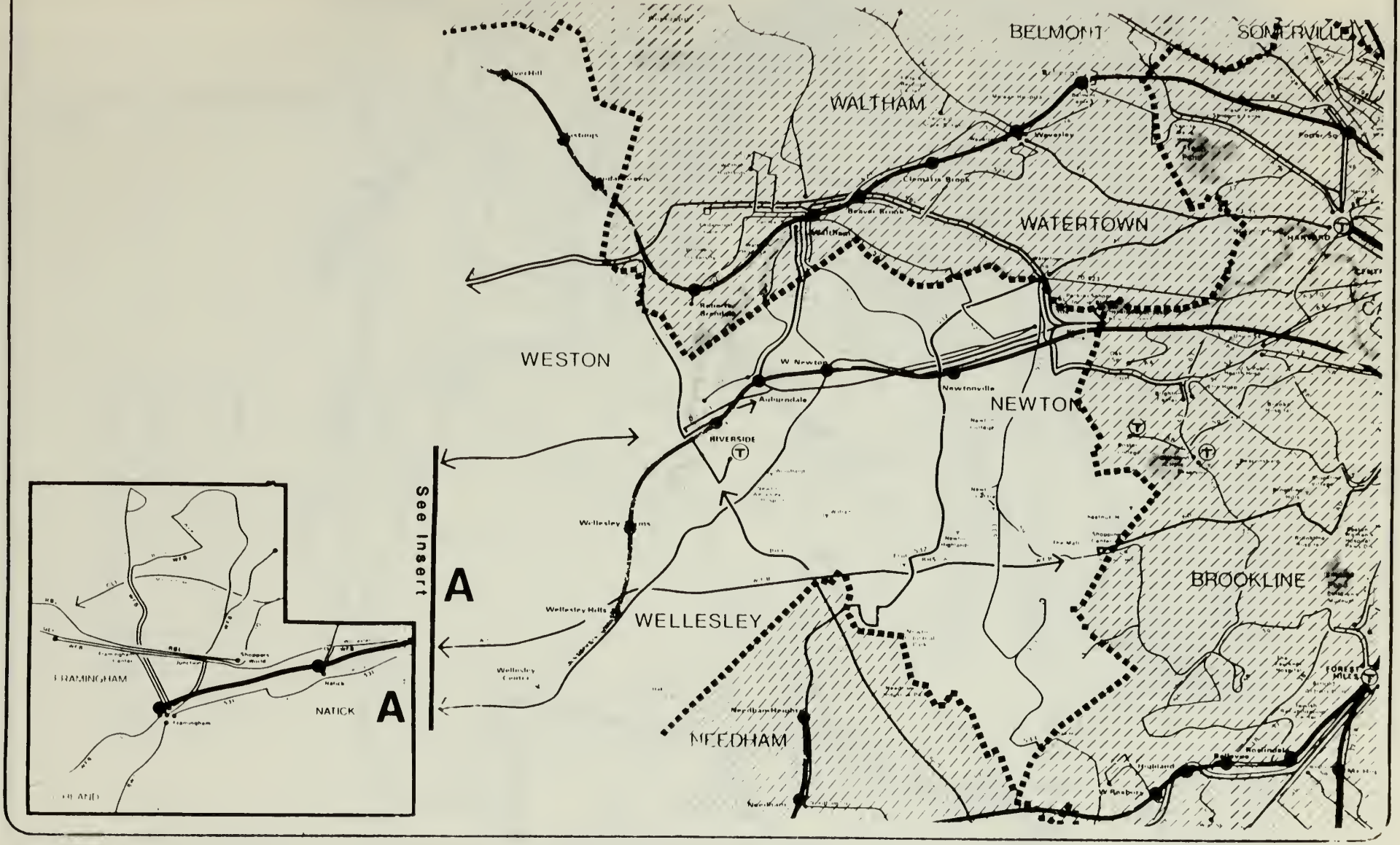
Red Line service to Quincy Center formed the anchor for service in the South Shore Corridor. Routes from Hingham, Weymouth, and Braintree terminated at the end of the Red Line. Other routes began at Quincy Center and parallelled the Red Line for some or all of their paths. These routes provided local travel along the Red Line's alignment, serving passengers in the various neighborhoods of Quincy.



Northwestern Corridor

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

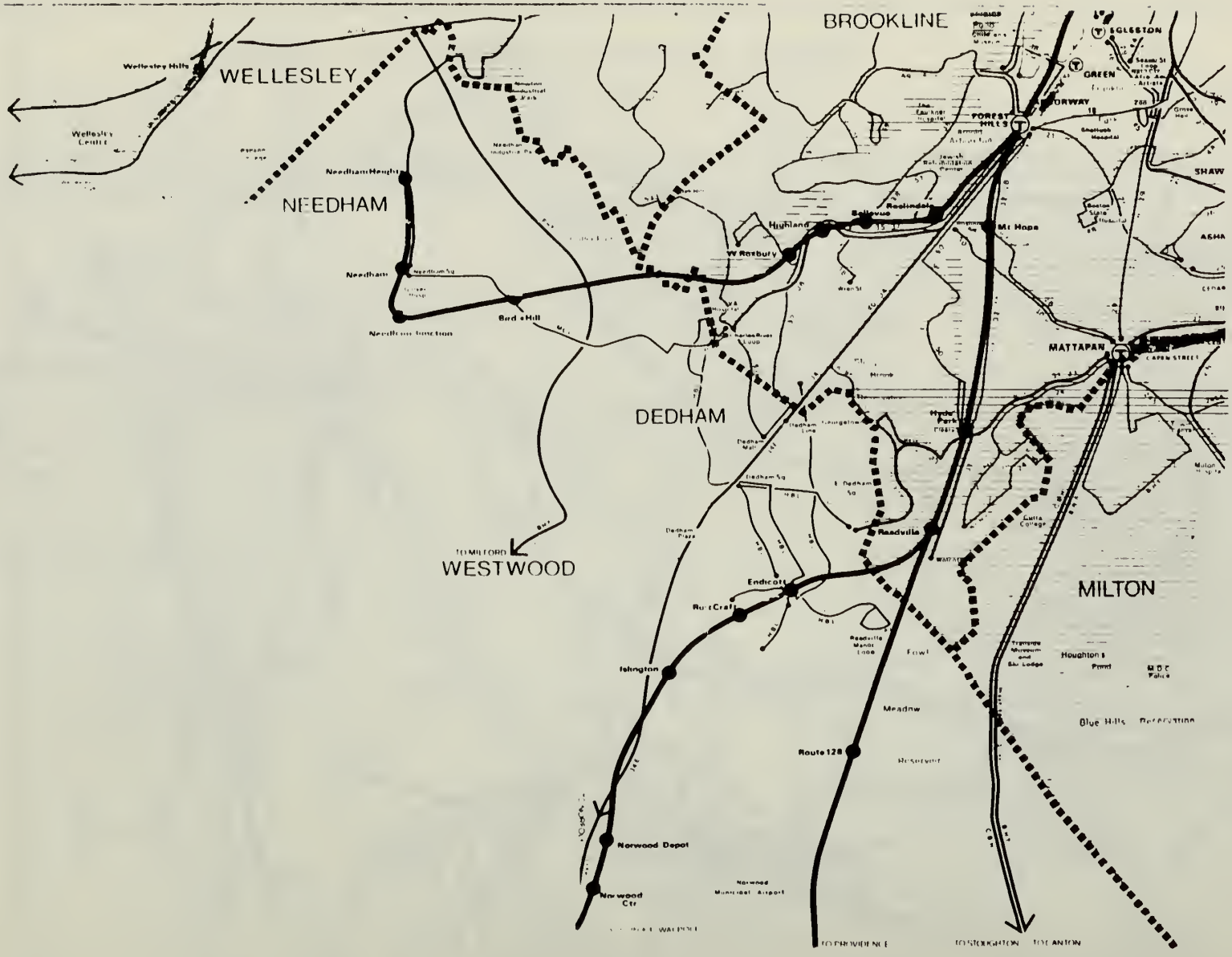
Exhibit I-5



Western Corridor

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

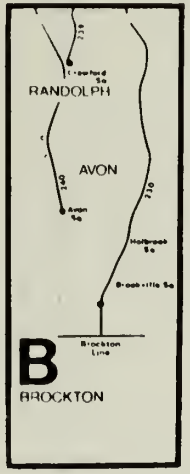
Exhibit
I-6



Southwestern Corridor

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
I-7



South Shore Corridor

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
I-8

Routes between Quincy Center and Mattapan passed through Milton, providing circumferential service that offered access to two radial line-haul services.

g. Core Area (Exhibit I-9)

The core area is the heart of the region and the convergence point of regional line-haul transit. Bus-route density is high in this area because population and travel volumes are high. Most bus routes are still radial in nature, though their local distribution function is much greater than in the corridors.

Much of the bus activity is centered at the large rapid-transit stations, such as Sullivan Square and Maverick in the north, Harvard Square in the northwest, Boston College and Cleveland Circle in the west, Forest Hills in the southwest, and Mattapan, Ashmont and Fields Corner on the South Shore. Other rapid-transit stations, such as Egleston Square on the Orange Line, Columbia on the Red Line, Central Square on the Red Line in Cambridge, and Lechmere on the Green Line, all serve as concentration points for bus routes that travel solely in the core area.

Routes in Boston Proper are shown in Exhibit I-10. Most of these are radial routes that extend outside this area.

2. Fares

Fares on the routes of the MBTA bus system are defined in the Systemwide Fare Tariff book. For the time period of this survey, the 1978 edition was in effect. It is difficult to describe this fare structure concisely, because it did not follow uniform rules. The fare structure had a historical background that tended to inhibit the application of broad principles. The bus system developed, as did the rail, by the unification of a number of independent properties under the control of the MBTA. With these takeovers came the acceptance, in large part, of the fare structure that had been in effect. However, the MBTA has made changes in the fare structure to make it more equitable and more uniform.

A general description follows of the bus-fare structure in effect during the time of the survey. For fares on specific bus routes, please refer to the Systemwide Fare Tariff book for 1978.

The MBTA had six patron classes, which were applied to four route types. The same patron paid different fares, depending on the type of route. Routes were classified into types according to the area traveled through and the nature of the service provided. The six patron classes were:

1. Basic Adult - an adult traveler without identification showing registration with the MBTA as a senior citizen or as handicapped

Core Area

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit I-9

Boston Proper

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit I-10

2. Senior Citizen - individuals 65 years old or older who registered with the MBTA and had a MBTA identification card

3. Child - children ages 5 to 11 (children under 5 years of age were permitted to ride the system for free)

4. Student - students in grade 12 and below who were issued a badge (fare valid only on school days, until 5:00 P.M.)

5. Blind

6. Handicapped - individuals who are handicapped, with identification showing registration with the MBTA

The four route types were:

1. Urban - routes traveling in high-density areas. These corresponded to the old Metropolitan Transit Authority's routes.

2. Suburban - routes which traveled within outer, lower-density areas. These corresponded to routes that were formerly run by private suburban bus companies, or were new routes added by the MBTA.

3. Express - routes that traveled to the central business district of Boston from the suburbs. This was a premium service that picked up passengers, then traveled closed-door to the destination area, where local operation resumed for distribution of passengers.

4. Replacement - Route 39 only. This route was added to replace service lost on the Arborway Branch of the Green Line.

Basic Adult fares on the route types were:

1. Urban - $.25 per trip for all routes, regardless of distance traveled. Fares could be paid using cash or pre-paid monthly passes.

2. Suburban - $.25 per trip, plus any zone fares, depending on the number of zones traveled through. Fares ranged from $.25 to $ 1.00. Fares could be paid using cash, pre-paid monthly passes, or ten-ride $.95 tickets.

3. Express - fare specified by route. It was considered a premium service. Fares ranged from $.65 to $.95. Fares on express buses could be paid using cash, pre-paid monthly passes or ten-ride $.95 tickets.

4. Replacement - $.20 for travel between Northeastern University and Arborway Station; free passage between Copley Square Station of the Green Line and Northeastern University, where, it was presumed, the rider paid a fare on the rapid transit system. Fares could be paid using cash or pre-paid monthly passes.

Fares in other categories were:

1. Senior Citizen - 1/2 the Basic Adult fare, rounded down to the nearnest $.05. For example, $.25 became $.10. Senior Citizen fares were payable in cash only.

2. Children - 1/2 the Basic Adult fare, rounded down to the nearest $.05. See "Student" below, for information regarding transfers.

3. Student - 1/2 the Basic Adult fare rounded down to the nearest $.05. Fares were payable in cash, blue or white urban tickets, or 10-ride suburban tickets of various denominations. Students and children were entitled to free transfers. A student or child on an urban bus could get a transfer to a rapid transit line and another urban bus. A student or child coming from a rapid transit line could pay for his or her ride with a transfer received from the collector at the station at which he or she paid the first fare. Students and children on the suburban buses had a different transfer system which allowed free transfer only in an adjacent zone of another suburban bus (e.g., a student transferring onto a $.35-adult-fare bus in a non-adjacent zone would present the transfer and deposit $.05 in the farebox).

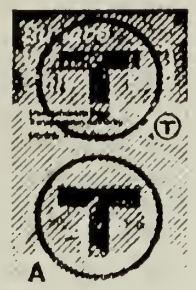
4. Blind - free service at all times.

5. Handicapped - 1/2 the Basic Adult fare, rounded down to the nearest $.05, during off-peak hours. Full Basic Adult fare was required from 7:00 to 9:00 A.M. and 4:00 to 6:00 P.M. Cash payment was required for all reduced fares.

Cash fares were required to be remitted as exact fares in coin. If the passenger did not have exact fare, he or she could remit the smallest amount of money available that exceeded the fare and receive change in scrip. This scrip could be taken to the treasurer's department of the MBTA and redeemed for cash. Due to the inconvenience of this procedure, there was a minimal redemption rate and most passengers with overpayments did not request scrip.

Five types of prepaid passes were used on buses during the survey period. See Exhibit I-11 for a detailed explanation of the prepaid pass program.

A
25c Surface
Vehicle Pass
$2.00 per month



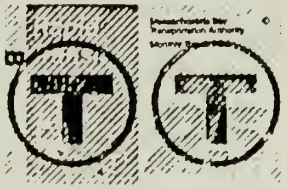
Valid as follows

All bus and trackless trolley routes that charge a basic 25c adult fare, or one 25c fare on a local suburban Bus Route, balance in cash

All 20c or 25c surface Green Line fares

Not valid on any Rapid Transit Express bus or subway portion of the Green Line

B
25c Rapid Transit
Pass
$3.00 per month



Valid as follows

All stations on the Blue Line

All stations on the Orange Line (except Malden Center and Oak Grove)

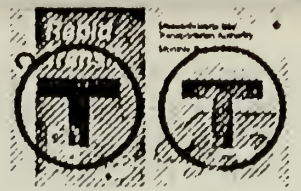
All stations on the Red Line except North Quincy, Wollaston, and Quincy Center

All stations on the Green Line between Lechmere and Kenmore, and Lechmere and Symphony

Not valid for ½ fare at a 50c station

Not valid on any surface 25c bus, trackless trolley, 20c and 25c surface streetcar or express bus route

C
45c Rapid Transit
and Surface Bus
Pass
$18.00 per month



Valid as follows

All stations on the Blue Line

All stations on the Orange Line (except Malden Center and Oak Grove)

All stations on the Red Line (except North Quincy, Wollaston and Quincy Center)

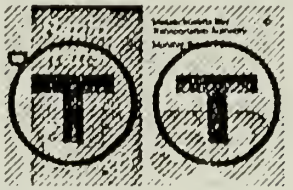
All stations on the Green Line between Lechmere and Kenmore, and Lechmere and Symphony

All streetcar lines that charge a basic 20c adult fare, either single or in combination with any of the above

Not valid on the Riverside Line or any other Rapid Transit Station

Not valid on any bus, trackless trolley, or express bus route

D
50c Rapid Transit
and Surface Express
Bus Pass
$18.00 per month



Valid as follows

All stations on the Blue Line

All stations on the Orange Line (including Malden Center and Oak Grove)

All stations on the Red Line including North Quincy, Wollaston, and Quincy Center

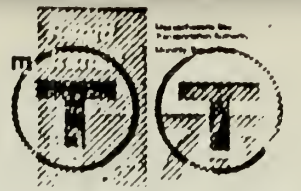
All stations on the Green Line including the Riverside Line

All bus and trackless trolley routes that charge a basic 25c adult fare. Also when entering or leaving a 25c Rapid Transit Station only

All 55c and 60c express bus routes that enter or leave Haymarket or Park Sq, Boston

Not valid on any Bus Route entering or leaving a 50c Rapid Transit Station

E
[illegible]
$[illegible] per month



Valid as follows

All Red, Orange, Green and Blue Line Stations including Quincy, North Quincy, Wollaston, Riverside, Malden and Oak Grove

All surface streetcar routes that charge a basic 20c or 25c adult fare

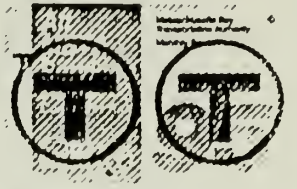
All bus and trackless trolley routes that charge a basic 25c adult fare or one 25c fare on a local suburban Bus Route, balance in cash

Two 20c zones entering or leaving a 25c Rapid Transit Station

One 20c zone entering or leaving a 50c Rapid Transit Station

All 50c, 55c, 75c, and 80c Express Bus Routes that enter or leave Haymarket Square and Causeway St and Court, Sq, Boston

F
[illegible]
$[illegible]



Valid as follows

All MBTA Services or any combination of services, regardless of fares

Not valid on Commuter Rail Board Lines

All passes are valid at the first stop outside the subway on the Green Line.

THESE STOPS ARE: Northeastern on the Arborway Line, Fenway on the Riverside Line, Blanford St. on the Commonwealth Line, and St. Mary's on the Beacon St. Line.

Massachusetts
Bay
Transportation
Authority
Community Affairs and
Marketing [illegible]

1978 MBTA Transit Passes

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
I-11

II. DATA COLLECTION AND REDUCTION PROCEDURES

A. Synopsis

Surveying each of the scheduled runs for all bus routes of the MBTA was a monumental task. About one hundred and fifty people were needed to ride the buses collecting data. The team of professionals grew to as many as twelve people during the difficult post-survey data-processing task at CTPS. Data was collected and questionnaires were distributed to passengers on a sampling of runs for every MBTA bus route in operation.

The survey was conducted in the spring and fall of 1978, between 6:00 A.M. and 12:00 midnight each survey day. Bus routes were grouped according to the rapid transit stations they served, and the personnel assignments made on the basis of routes coming from a common rapid transit station. Supervisory personnel directed the group of surveyors at each of these rapid transit stations. Individual surveyor assignments were made up of a few bus runs, not necessarily on the same route.

The data-collection process for a given route took place on two days. On the first day, the surveyor would record total passenger boardings for the run, the farebox reading for the beginning and the end of the run, and actual departure time (and note scheduled departure time). The passenger "interview" survey was also passed out to every passenger. On the second day, the surveyor once again collected total boardings, actual start time, and farebox readings. In addition, on/off counts were made at every stop of the route and farebox readings were taken at each town line.

Information gathered each day was brought back to the field office for coding and corrections. It became clear during the spring survey that the desired coverage of runs in the schedule was not being met. A plan was developed to collect data on missed runs in the fall of 1978. Data was collected in the fall in the same manner as in the spring, except that the trips to be sampled were chosen to supplement the data collected in the spring.

The data collection was conducted by Wilbur Smith and Associates, which turned the data over to CTPS for processing. Two persons who had worked for Wilbur Smith and Associates during data collection were taken on by CTPS to work on processing the data. Cleansing of the data for keypunch errors and improper coding was carried out, after which the various data products

were created. Boardings for all routes were developed, unsurveyed runs being "filled in" with estimates. Boardings and alightings by stop were also "filled in" for missing runs and then factored up to the boarding control totals. Survey sample data on the socioeconomic and trip-making characteristics of bus passengers were expanded using a technique that coped with the problem of limited responses on some bus runs. The results were factored to the boarding control totals. A computer file prepared from the data is available at CTPS, and can be summarized in almost any manner.

B. Field Data Collection

About 150 people were hired to conduct the survey. Bryant Associates, Inc., subcontractor to Wilbur Smith and Associates for the field work, contacted local state employment offices, universities, and public agencies to locate personnel for this temporary or part-time employment. The surveyors hired were students and unemployed people who had no previous experience in surveys. Each of the persons hired was given a brief training session.

Bus routes were grouped according to the rapid transit station that they served. Copies of the Bid Sheets which were used by the MBTA drivers to select their quarterly daily work schedule were also gathered so that survey planners would know how bus runs were linked together. By using the Bid Sheets and determining the common rapid transit stations, a day's work for a surveyor was laid out. Supervision was effected by having Area Supervisors work from a rapid transit station to direct a number of surveyors. One day's assignment for a surveyor was recorded on an Assignment Sheet. Exhibit II-1 is an example of a typical sheet used to direct the collection of data on two days. In the subsequent processing of the data, this sheet served as the cover for the packet containing all the detailed data sheets associated with the surveyor's assignment.

Bus survey work started on April 8 and continued until June 23, 1978. Review of the coverage of routes surveyed showed that there was a need to survey additional trips to insure adequate coverage of the daily schedule of runs. This additional surveying was done from October 13 to December 29, 1978. During both survey periods, surveyors collected data between 6:00 A.M. and 12:00 midnight.

Implicit in the data-collection method was the assumption that post-survey data reduction would take the observations made on the bus routes on different days and combine them into one "composite" day. The runs making up the daily (weekday) schedule for the spring of 1978 were chosen to constitute the composite day, and all data analysis to follow was designed to estimate statistics for that day. MBTA bus runs were scheduled from

ASSIGNMENT SHEET

MBTA Bus Passenger Surveys

NAME _____

DATE 5/12/78 TERMINAL Dudley

LOCATION _____

TERMINAL	RUN NO	ROUTE NO.	START TIME	FINISH TIME
	1052	01	6^15 AM	7^18
			7^18	8^19
			8^19	9^27
			9^27	10^28
Change Buses				
	1097	42	10^57	11^19
			11^19	11^41
			11^41	12^03
			12^03	12^25
			12^25	12^47
				RAIN
				5/13/78

Surveyor's Assignment Sheet

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit II-1

before 6:00 A.M. until after 1:00 A.M., which meant that the survey would miss all runs at the beginning and the end of the scheduled day. As will be discussed later, post-survey data reduction estimated statistics for these runs.

1. Passenger-Count Data

Boardings on all buses surveyed were the most basic data collected during the survey. Data takers recorded the number of people who boarded each bus surveyed. As in the rail-passenger count, cash readings were taken at the same time, but the bus survey did not count the number of pass users.

a. Purpose of Boarding Counts

The boarding counts for each bus run surveyed were the fundamental data used to develop estimates of ridership for the composite-survey-day schedule. Control counts derived from these data were used to factor the questionnaire responses and the bus-stop on/off data. Boarding-count data also provided a means of checking revenue data collected.

b. Method of Data Collection

Passengers were counted on each bus surveyed. Not all bus runs in the schedule were surveyed. The surveyors collected data only from 6:00 A.M. until 12:00 midnight. Therefore, a few early-morning and late-night runs were missed by virtue of the survey design. Also, despite a very purposeful effort, not all scheduled trips during the survey hours were covered. Therefore, simple aggregation of collected boardings would not yield complete boarding totals. Subsequent data reduction solved these problems by smoothing the data and created all necessary control totals.

Each surveyor rode a number of runs during his or her daily assignment. These runs were summarized on the Assignment Sheet. Boarding data was recorded on the B-1 Bus Route Data sheet. Several other data items were collected on this sheet, such as the information identifying the run the surveyor was on. A B-1 sheet is shown in Exhibit II-2. Bus runs were surveyed on two days to gather all data. B-1 sheets were kept for both days.

Boarding and alighting data was collected on a run's second survey day. A listing of stops for a run was prepared in the survey office. This listing was called a B-2 Stop List, a sample of which is shown in Exhibit II-3. Difficulties developed with this information because surveyors had trouble recognizing stop identifications. Also, stops were grouped under one name so that not all actual stops were on the sheet. The stops were named after an intersecting street or a landmark near the stop. These names were sometimes difficult to note from inside the moving bus.

B-1 BUS ROUTE DATA

Name_____ Date_____ Terminal_____

Trips Outbound from the Terminal

Route#							
Run#							
From							
To							
Time Begin							
Fare Box	Cash						
	Pennies						
Questionnaire#							
Time End							
Fare Box	Cash						
	Pennies						
Questionnaire#							
Total Boardings							

Trips Returning to the Terminal

Route#							
Run#							
From							
To							
Time Begin							
Fare Box	Cash						
	Pennies						
Questionnaire#							
Time End							
Fare Box	Cash						
	Pennies						
Questionnaire#							
Total Boardings							

1978 Survey B-1 Form

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit II-2

160 0010 1

Do not write above this line

Pt 01 Rt. description DUDLEY Sta. - HARVARD Sq.

Time _____ Date _____ Terminal _____

STOPS	RUN 1 Time Begin		RUN 2 Time Begin		RUN 3 Time Begin		RUN 4 Time Begin		RUN 5 Time Begin		RUN 6 Time Begin		RUN 7 Time Begin	
OUTBOUND	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
01 DUDLEY Sta.														
02 WARREN														
03 RUGGLES														
04 EUSTIS														
05 HUNNEMAN														
06 THORNDIKE														
07 LENOX														
08 NORTHAMPTON														
09 SHAWMUT														
10 TREMONT														
11 COLUMBUS														
12 ST. BOTOLPH														
13 MASS + HUNT.														
14 NORWAY														
15 MASS + BOYLSTON														
16 MASS. Sta.														
17 Comm Ave.														
18 BEACON														
(19) MEMORIAL DR.														
20 MIT														
21 U VASSAR														
22 O FRONT														
23 G MASS + MAIN														
24 H CENTRAL Sq.														
25 K TEMPLE														
26 D Bigelow														
27 E LEE														
28 C HANCOCK														
29 U DANA														
30 TROWBRIDGE														
31 MASS + HARVARD														

T.V. BOSTON

CAMBRIDGE

1978 Survey B-2 Form

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit II-3

The primary source for the derivation of peak-load points, terminal loads, and distributions of activity along a route is the B-2 Stop List data. It was collected along with the boarding data for a sampling of runs. Data reduction rationalized and factored this data to the produce needed survey products.

2. Questionnaire-Survey Data

Characteristics of the passengers of the MBTA bus system were gathered through the use of a questionnaire survey. By gathering the responses of a sample of the riders, an estimate of the attributes of the general population of passengers could be developed.

a. Purpose of the Questionnaire Survey

The MBTA requires information about the characteristics of the ridership of a bus route in order to set the number of trips and the schedule. To gather data on these characteristics, a questionnaire was distributed as part of the data-collection program. It collected information on trip purpose, frequency, origin, and destination, and on mode of access to the bus, fare paid and socioeconomic characteristics.

b. Method of Data Collection

Passenger characteristics were gathered through the use of a questionnaire which passengers were requested to fill out and return. These questionnaires were distributed on the first day that a run was surveyed. Surveyors were to give one to each person who boarded the bus. It is clear that coverage of passengers was much less than complete for most runs when a comparison is made of boardings and questionnaires distributed (see Exhibits II-4 and II-5). Like the boarding counts, the passenger survey did not cover all bus runs in the MBTA schedule (see Exhibit II-6): the data on passenger characteristics was gathered for only a subset of scheduled runs. Of the questionnaires distributed, approximately 27 percent were returned. The limited number of returns and problems associated with the sampling process were dealt with in the data-reduction phase of the post-survey processing.

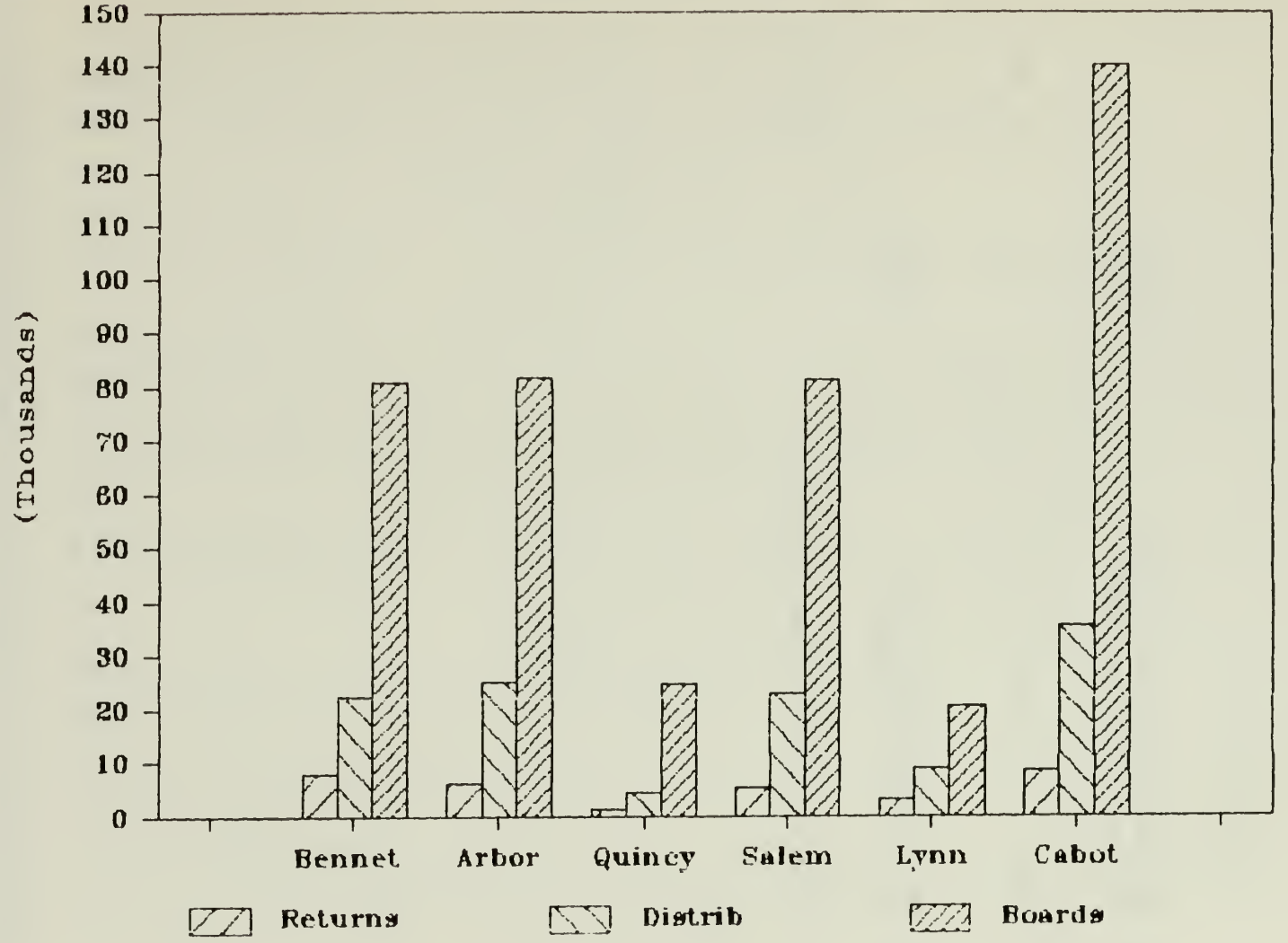
The basic format of the questionnaire was like that of the questionnaire distributed in the rail portion of the passenger survey. A copy of the questionnaire is shown in Exhibit II-7. The bus survey did not have a Spanish version, to the knowledge of CTPS. Each survey had an address and prepaid-postage guarantee on the front, so that it could be mailed back should the passenger not be able to return it to the surveyor when he left the bus.

Serial numbers were stamped on the questionnaires. The surveyors recorded the numbers of the first and last questionnaires

	Total Boardings	Questionnaires			
		Distributed	Returned	Returned as Percent of Distributed	Returned as Percent of Boardings
Bennett St	81,012	22,175	7,864	35.5%	9.7%
Arborway	81,538	25,107	5,971	23.8%	7.3%
Quincy	24,498	4,546	1,101	24.2%	4.5%
Salem St	81,213	22,790	5,405	23.7%	6.7%
Lynn	20,601	8,941	3,040	34.0%	14.8%
Cabot	140,078	35,409	8,591	24.3%	6.1%
Total	428,940	118,968	31,972	26.9%	7.5%

Bus Questionnaires Distributed
Versus Returned and Boardings
by Garage (Table)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
II-4



Bus Questionnaires Distributed
Versus Returned and Boardings
by Garage (Graph)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
II-5

Total Spring Scheduled Trips	15,529	
Total Spring Trips Surveyed	9,385	
Percentage of Spring Trips Covered		60.4%
Total Fall Scheduled Trips	15,431	
Total Fall Trips Surveyed	5,925	
Percentage of Fall Trips Covered		38.4%

Scheduled Trips Covered in
Questionnaire Survey by Season
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
II-6

M B T A PASSENGER SURVEY

Please COMPLETE and RETURN this questionnaire before leaving the bus. This survey is being conducted for the MBTA in order to plan for better service. Your cooperation is appreciated. Please drop your questionnaire in the envelope when you leave the bus. If this is not convenient, drop it in any mailbox (we will pay the postage). It is NOT necessary to sign the form or otherwise identify yourself.

DO NOT WRITE IN THIS SPACE OFFICE USE ONLY

1. Where did you come from before boarding this bus? Home Work School Shopping Social/Recreation Medical/Dental Other
   The place you came from is located at Address [ ] [ ] [ ]

they distributed on the B-1 Bus Route Data sheet. Through this information, a questionnaire was connected to the run that the passenger was riding.

C. Data Reduction

Various post-survey processing tasks were required once the data had been collected in the field. These tasks comprised cleaning the data, checking it for consistency, filling the voids in the coverage of the survey data collected, and producing the survey reports. All final products required some expansion of the data collected to form a complete estimate of ridership and passenger characteristics. This was necessary because every data item was collected on a sample basis, unlike in the rail segment of the program, where the passenger-count information was collected in a 100-percent count except for the very beginning and ending hours of the schedule day.

1. Passenger-Count Data Cleaning

The first task after collection of the passenger-count data was cleaning the data records of surveyors' errors and of errors developed in the translation of the data into computer-readable form. This task was carried out with the help of two persons who had worked for Wilbur Smith and Associates during the data collection and were familiar with the problems encountered. Computer programs were used which examined the translated data.

Two types of errors were discovered. Some records had been incorrectly coded to a route by the surveyor or the field office. The other type of error was inconsistencies in the data collected, such as between boardings and revenue in the farebox. Corrections were made through examining the original B-1 Route Data sheets, considering the problems known to have been encountered during the survey, and using average values for various data.

2. Passenger-Count Data Expansion

Not every bus run could be counted during the survey, making it impossible to simply sum up the boardings collected to form control counts. An estimate had to be made for each run which had not been counted. After matching all the runs collected to a computer-readable schedule, runs missed were determined. It was decided that the daily (weekday) schedule for the spring of 1978 would define the composite survey day. Realizing that the coverage of runs would not be acceptable, Wilbur Smith and Associates collected additional data in the fall of 1978. The idea was that fall boardings would be much like spring boardings because the schedules are similiar. The survey was suspended during the summer schedule, when fewer runs were needed to cover the lighter demand of summer travelers. The combination of the spring and fall data provided the base needed to create control counts.

Even with the supplementary data collected in the fall, not all scheduled runs were covered. Early-morning and late-evening buses were not covered because the survey collected data between 6:00 A.M. and 12:00 midnight. Other runs during the day were not included in the sample, some intentionally and some because of logistical problems. Estimates of ridership on runs that were not surveyed were derived by looking at other runs on the same route or similiar routes that ran in close proximity of time.

All the boarding data collected was used to create arrival-rate data for boarders of each run. This arrival rate was calculated by dividing the boardings by the headway. Where there was no previous bus run or the headway was greater than twenty minutes, a maximum value of twenty minutes was assumed. Arrival rates were then plotted by time of day. Missed runs were also noted on these plots. The plot for Route 1 is shown in Exhibit II-8 as an example. An analyst then examined each plot and interpolated a value for each missed run.

Filling out the schedule was then accomplished in two steps. The interpolated arrival rates were integrated into the computer-readable schedule file, along with the fall-schedule data chosen by analysts to be combined with the spring-schedule data. To facilitate the work, a computer program was created which merged the fall and spring data. The program then multiplied the interpolated arrival rate by the run's headway to create a complete schedule with a boarding value estimate for each run.

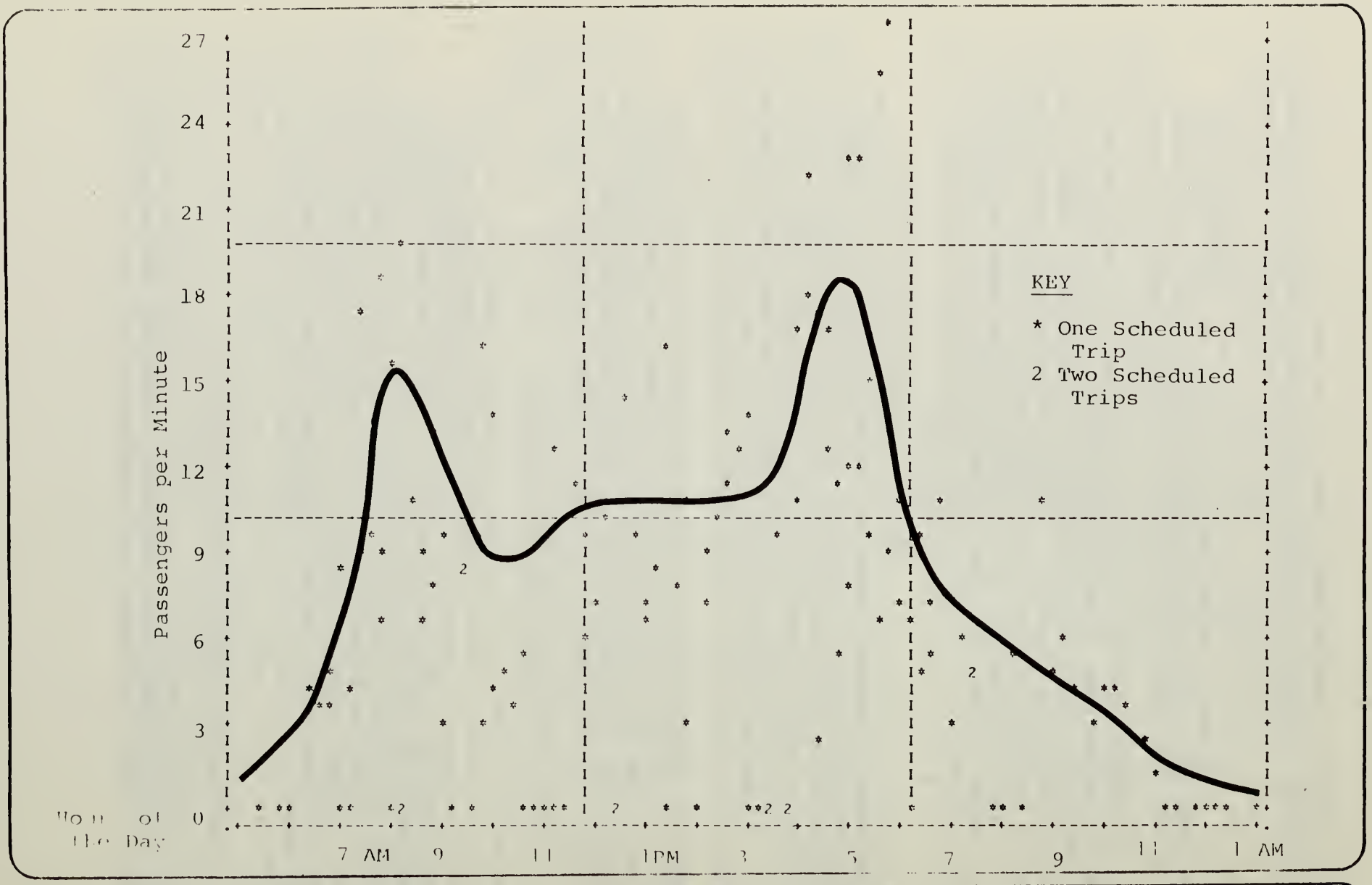
Boarding totals for any selection of routes can be created from this complete schedule file. Since each run is listed separately, the file offers the most basic data about boardings that the survey data can provide. Control totals for the questionnaire-survey expansion were developed using this file.

3. Questionnaire-Survey Data Cleaning

The serial numbers of the questionnaires passed out on each route were recorded. These ranges of numbers sometimes needed correction because of surveyor errors and problems associated with keypunching the data into computer-readable form. The special knowledge of the CTPS personnel who had previously worked for Wilbur Smith and Associates during the survey was very helpful in making these corrections. This was a time-consuming process, but it was necessary because it is through this link that the characteristics of the passengers are linked to a route. A limited amount of editing of the responses on questionnaires was also done.

4. Questionnaire-Survey Data Expansion

Given the limited number of passenger responses for each route, a method of expansion had to be developed that coped with the light response rate yet took advantage of all the survey



Arrival Rate Plot for Route 1

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit II-8

information that was collected. Difficulties arise when a simple factoring process is applied to a survey where responses are low. In factoring, responses of the persons questioned are weighted by the number of people who are in the stratum (grouping) they represent. Here, the stratum is the number of people boarding a bus. In simple factoring schemes, if five people respond to the questionnaire and fifty people boarded the bus, then each respondent represents ten persons and the weight of each questionnaire is ten. The weight on every questionnaire is the same.

When only a very few persons respond compared to the total number of boarders, these simple factors are very large. Large factors are not good because they tend to over-emphasize the respondents' answers, making specific persons' answers weigh much more than they should. Statistics summarized from limited responses represent the characteristics of the small population of respondents instead of the total grouping. The ultimate limit is the case where no one on a bus run responds to the questionnaire. Simple factors cannot be calculated in this case. However, to ignore a large number of riders would be wrong.

A solution to the problem is to make an estimate as to the characteristics of these riders. In the case of a limited number of responses, when the factors would be excessively large, one blends such an estimate with the distribution derived from the available data. Other methods, such as drawing questionnaire responses from runs with similiar characteristics, can be used to take care of low response rates and lack of responses. However, the method of blending in an estimate was used in this study, because, being more computer-time-intensive, it requires less comuter-memory space. With a file of 32,000 responses, computer space was at a premium, and more demand upon memory would have made the problem impossible for the computer to handle. The blending method is also a bit easier to understand and implement.

To apply this expansion procedure to the survey, the routes were first classified according to three criteria: type of route, time of day, and direction. The three types of route were Urban, Suburban, and Commuter. Urban routes were those that served principally high-density areas in or near the City of Boston and had short headways. Suburban routes were those that traveled through communities of lower population density located about seven to ten miles from the center of Boston. Radial high-speed, limited-stop, or line-haul routes were defined as Commuter. Seven time-of-day periods were established. Direction was either inbound or outbound.

For runs with no responses, there were substituted the characteristics that had been derived from the questionnaires received on all surveyed runs having the same criteria as those runs. For low-response routes, the characteristics derived from the responses were blended with the applicable generic characteristics.

To construct a tabulation of expanded passenger-characteristic statistics, the algorithm requires first tabulating separately the applicable generic characteristics and the characteristics developed from any survey responses for the specific routes. Then the generic and run-specific characteristics are blended for each route, during each period, for each direction. The blending is accomplished using two weighting factors. The factor for the run-specific component is directly proportional to the number of questionnaires returned for the run. The factor for the generic component is the complement of the run-specific factor.

The blended characteristic is multiplied by the boardings for the run during the appropriate time period and in the appropriate direction, to derive the absolute number of estimated passengers that share this characteristic. This absolute result can be aggregated to any desired level and proper statistics will be obtained. Note that the blending has been done at the finest level of detail, and that results at that level can be produced if needed.

III. PASSENGER-COUNT RESULTS

A. Introduction

Comprehensive passenger counts on the MBTA bus system are not taken on a regular basis. Instead, the Authority counts selected routes and monitors revenue data at the bus-garage level. The magnitude of counting 15,529 daily runs is enormous and the MBTA could not afford to maintain a staff large enough to do the job. The 1978 Passenger Survey was initiated by the MBTA in part to provide a complete count of the bus system. For one schedule period, a majority of the bus runs were counted. For the runs missed, boarding estimates were developed based on counts taken later of similar runs, counts of other runs made on the same route at proximate times, or boarding rates derived from similar routes. Together, these counts and estimates formed the basis for a comprehensive and detailed record of bus boardings.

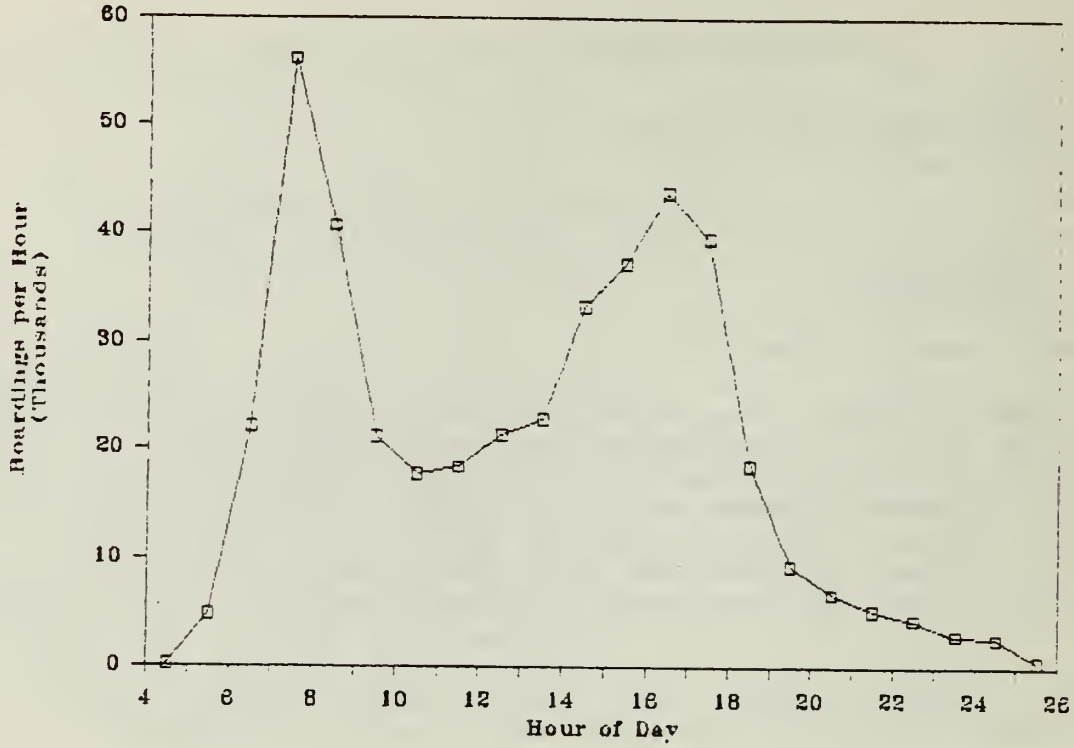
Boarding information and the associated revenue data are presented at various levels of detail in this chapter. The results will first be presented for the system as a whole, and then by route type, garage, and specific route.

B. Systemwide Results

A total of 429,000 one-way person-trips were estimated to have been made on all MBTA bus runs operated on the composite survey day. This ridership is the equivalent of three fourths Boston's population (562,994), and is greater than the population of Pittsburgh (424,000), the 30th largest city in the United States.

According to the 1978 Survey estimates, about 59,000 more trips were made on the bus system than on the rail rapid transit system of the MBTA, a difference of 16 percent. However, this difference is overstated, because the survey underestimates rail-system ridership in two ways. First, the 1978 total does not include Arborway boardings, because they were collected like bus data and were not processed for the rail estimates. Second, the rail survey missed trips before 6:00 A.M. and after 12:00 midnight, and no estimate was made for these trips.

The distribution of bus passenger trips by time of day is the familiar diurnal curve formed by the two daily peak periods of travel (see Exhibits III-1 and III-2). These peak values are reached between 6:30 and 9:00 A.M. and between 4:00 and 6:30 P.M. The morning peak contains the greatest hourly ridership of the

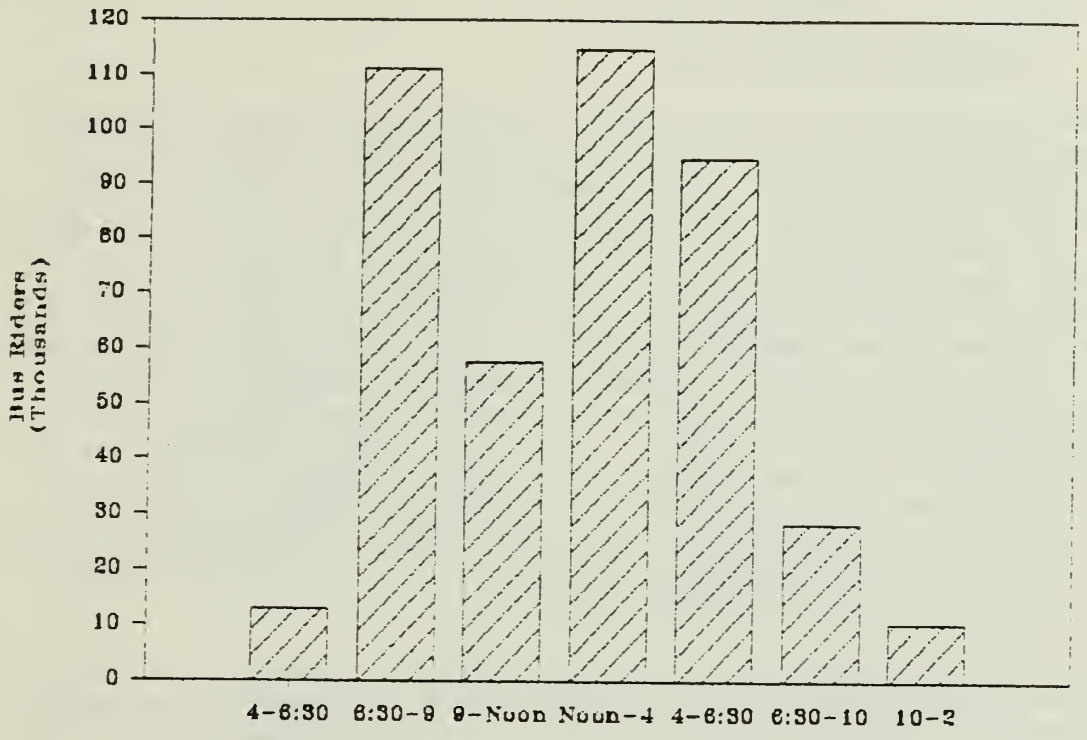


	Bus Riders	Percent
4-5am	169	.0%
5-6am	4,793	1.1%
6-7am	22,123	5.2%
7-8am	56,109	13.1%
8-9am	40,693	9.5%
9-10am	21,199	4.9%
10-11am	17,702	4.1%
11am-Noon	18,390	4.3%
Noon-1pm	21,361	5.0%
1-2pm	22,759	5.3%
2-3pm	33,160	7.7%
3-4pm	37,230	8.7%
4-5pm	43,838	10.2%
5-6pm	39,490	9.2%
6-7pm	18,477	4.3%
7-8pm	9,289	2.2%
8-9pm	6,706	1.6%
9-10pm	5,179	1.2%
10-11pm	4,353	1.0%
11pm-Midnite	2,911	0.7%
Midnite-1am	2,545	0.6%
1-2am	464	0.1%
Total	428,940	100.0%

Distribution of Bus Ridership
by Hour of the Survey Day

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
III-1



	Riders	Percent
4-6:30am	12,960	3.1%
6:30-9am	111,104	26.8%
9am-Noon	57,060	13.8%
Noon-4pm	114,510	27.7%
4-6:30pm	94,700	22.9%
6:30-10pm	28,280	6.8%
10pm-2am	10,270	2.4%
Total	428,840	100.0%

Time Distribution of Bus Riders

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit III-2

day: 56,000 persons travel between 7:00 and 8:00 A.M. (Exhibit III-1). Ridership builds during the midday starting at 12:00 noon to its afternoon peak of 44,000 between 4:00 and 5:00 P.M.

C. Analysis of Boarding Data

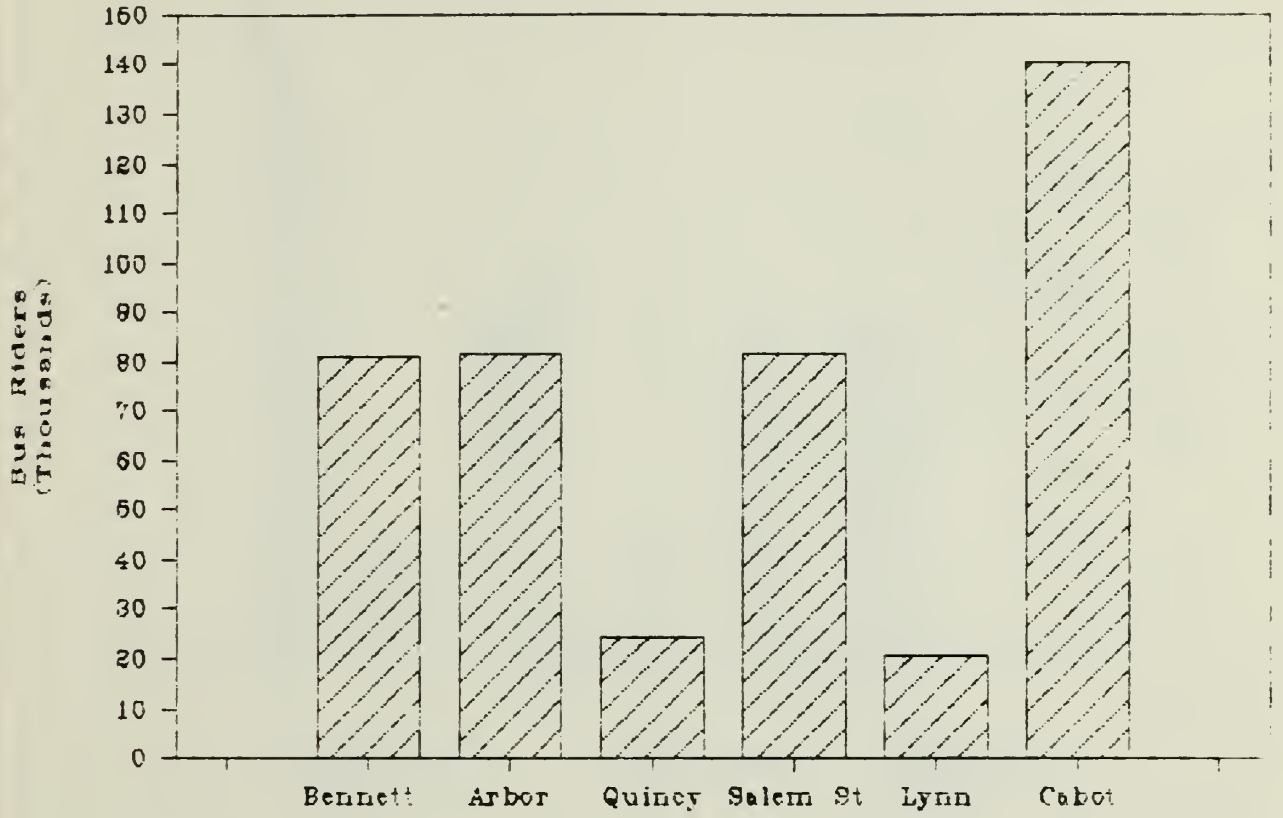
1. Boardings by Garage

MBTA bus routes are assigned to rating stations (garages) based on many factors related to geography and the historical development of the MBTA. This means that the ridership associated with the various garages is not evenly distributed among them. The garages fall into three groupings based on level of ridership (see Exhibit III-3). Cabot Garage is by far the largest of the MBTA garages. About one third of all passengers ride on routes based at this garage. Many riders on Cabot buses make multiple trips, but, if each trip were made by a unique rider, the garage would carry more people than the populations of Cambridge and Revere combined. Next in volume of trips are the Arborway, Bennett Street and Salem Street garages. Daily volumes of approximately 81,000 trips mean that each carries 19 percent of all bus passengers. The third level of passenger volumes comprises the Quincy and Lynn garages, which each carry about 5 percent of all bus passengers.

Detailed information for each garage is presented in Exhibit III-4. It is interesting in this exhibit to compare passenger boardings and revenue with the number of scheduled trips ("buses" in the exhibit) for each garage to get a preliminary indication of the cost of providing service. For example, Cabot Garage has greater numbers of boardings and greater revenue than the number of scheduled trips would indicate when compared to the other garages. In other words, Cabot has the greatest number of boardings per scheduled trip and greatest cash revenue per run. Unfortunately, it is difficult to analyze such differences between garages beyond simple observations of this kind. Other factors are involved which would require closer study. For example, population densities may be greater in the areas through which Cabot routes pass. Also, as will be seen later, cash fares are tendered by urban riders more frequently than other riders. Such factors and others would have to be examined in order to properly analyze cost of service. Still, the survey provides much of the data required to start such a study. Boardings and revenue per bus, by garage, are given in Exhibit III-5.

2. Boardings by Time of Day

Over 15,000 bus trips are scheduled throughout the day. About 48 percent of all passengers board during the peak periods of 6:30 to 9:00 A.M. and 4:00 to 6:30 P.M. About 40 percent board between the peaks. Evening trips account for 9 percent of the trips, leaving about 3 percent in the early morning (see Exhibit III-2). Comparison of the bus- and rail-trip distributions by time period shows close similarity (see Exhibit III-6).

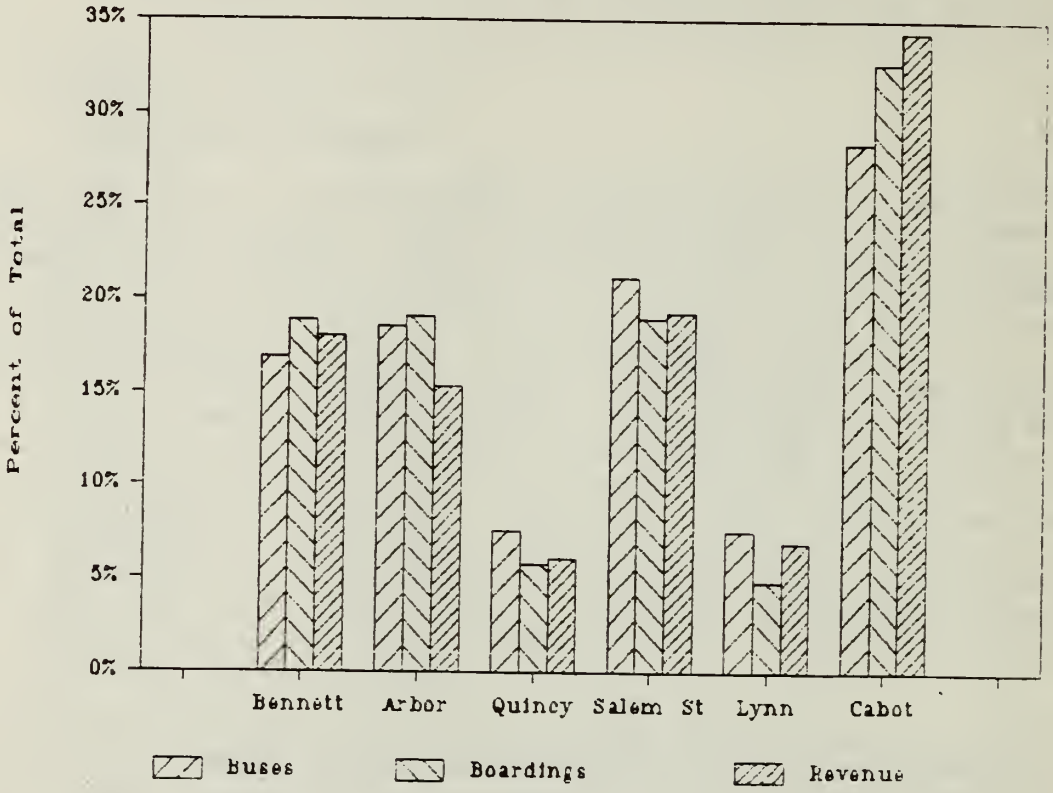


	Total	Percent
Bennett St	81,012	18.9%
Arborway	81,538	19.0%
Quincy	24,498	5.7%
Salem St	81,213	18.9%
Lynn	20,601	4.8%
Cabot	140,078	32.7%
Total	428,940	100.0%

Distribution of Boardings by Garage

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit III-3



	Bus Departures	Percent of all Buses	Boardings	Percent of all Boardings	Cash Revenue Received	Percent of all Revenue
Bennett St	2,619	16.9%	81,012	18.9%	$14,721	18.1%
Arborway	2,872	18.5%	81,538	19.0%	$12,489	15.3%
Quincy	1,173	7.6%	24,498	5.7%	$4,952	6.1%
Salem St	3,286	21.2%	81,213	18.9%	$15,732	19.3%
Lynn	1,177	7.6%	20,601	4.8%	$5,581	6.8%
Cabot	4,402	28.3%	140,078	32.7%	$28,037	34.4%
Total	15,529	100.0%	428,940	100.0%	$81,511	100.0%

Distribution of Buses Run, Boardings and Revenue by Garage

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

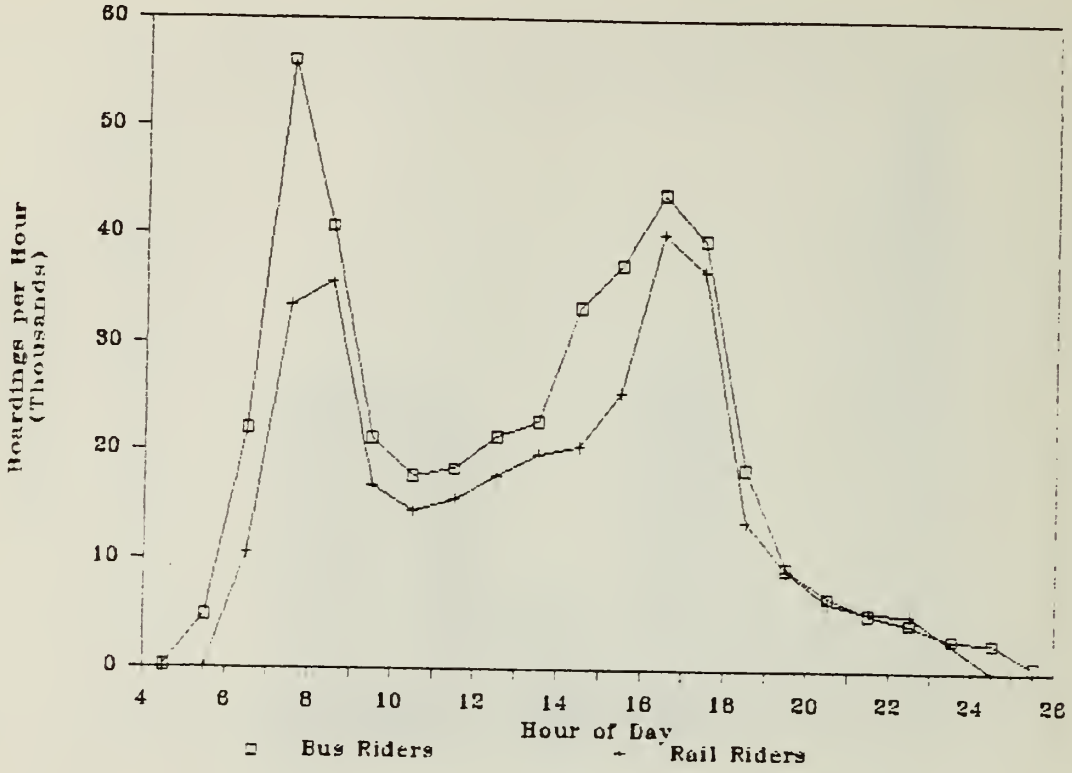
Exhibit III-4

	Boardings per Bus	Revenue per Bus
Bennett St	30.9	$5.62
Arborway	28.4	$4.35
Quincy	20.9	$4.22
Salem St	24.7	$4.79
Lynn	17.5	$4.74
Cabot	31.8	$6.37
Total	27.6	$5.25

Boardings and Revenue per Bus by Garage

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit III-5



	Bus Riders	Percent	Rail Riders	Percent
4-5am	169	.0%	0	0.0%
5-6am	4,793	1.1%	0	0.0%
6-7am	22,123	5.2%	10,596	3.2%
7-8am	56,109	13.1%	33,476	10.2%
8-9am	40,693	9.5%	35,447	10.8%
9-10am	21,199	4.9%	16,869	5.1%
10-11am	17,702	4.1%	14,450	4.4%
11am-Noon	18,390	4.3%	15,608	4.8%
Noon-1pm	21,361	5.0%	17,737	5.4%
1-2pm	22,759	5.3%	19,773	6.0%
2-3pm	33,160	7.7%	20,383	6.2%
3-4pm	37,230	8.7%	25,459	7.8%
4-5pm	43,838	10.2%	40,124	12.2%
5-6pm	39,490	9.2%	36,689	11.2%
6-7pm	18,477	4.3%	13,556	4.1%
7-8pm	9,289	2.2%	9,034	2.8%
8-9pm	6,706	1.6%	6,169	1.9%
9-10pm	5,179	1.2%	5,413	1.6%
10-11pm	4,353	1.0%	5,150	1.6%
11pm-Midnite	2,911	0.7%	2,542	0.8%
Midnite-1am	2,545	0.6%	0	0.0%
1-2am	464	0.1%	0	0.0%
Total	428,940	100.0%	328,475	100.0%

Comparison of Bus and Rail Riderships
by Hour of the Survey Day

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
III-6

3. Selected Rankings of Bus Routes

Several lists have been compiled ranking routes by notable statistical measures. Unlike the rail system, with its limited number of stations, bus routes are not easily categorized for discussion. There are 208 bus routes in the MBTA system, and most buses stop at many places along the way to pick up and discharge passengers. To mention each route and note its boardings and other summary statistics at each stop would result in a large report which would be of limited interest (boardings and buses by time period are, however, presented for all routes in Exhibit III-22). A geographic summary of bus information involves difficulties of organization, as has been discussed in the introduction to this report, and is an aggregate measure. Therefore, this section of the report will treat bus routes individually. In order to keep the presentation manageable, only the top 25 routes in each category will be included.

The first set of rankings lists the 25 routes with the largest number of bus trips run in both directions. Exhibits III-7, III-8, and III-9 present the rankings for the complete survey day, the A.M. peak period, and the P.M. peak period, respectively. Route 77, Arlington Heights-Harvard, had the greatest number of scheduled trips in all time periods. It had one-third more trips than the next largest route, Waverly-Harvard (Route 73), during the complete survey day. Third in number of survey-day trips was Watertown-Kenmore (57), fourth was Arborway-E. Walpole (34 & 34E), and fifth was the Arborway Line Replacement Service (39).

Rankings of number of buses run one-way (Exhibits III-10 to III-12) are much like the two-way listings. Bus routes usually have balanced numbers of trips with respect to direction, since the bus must travel back to the starting point to repeat trips.

Routes were also ranked according to the number of boardings in both directions. The same three time periods were used. For the complete day (see Exhibit III-13), Route 1, Harvard-Dudley carried the greatest number of passengers, over 2,000 more than any other route in the system. Over 2,000 passengers separate the second and third routes as well, Arlington Heights-Harvard (77) and Waverly-Harvard (73). Replacement bus service for the Arborway Branch of the Green Line (39) was fourth in volume, Mattapan-Egleston (29) fifth. The ridership of the twenty-fifth bus route, Franklin Park-Dudley (45), was less than one fourth that of the first-ranked route.

In the rankings of boardings in both directions in the A.M. and P.M. peak periods (see Exhibits III-14 and III-15), the second- and third-place routes of the complete-day ranking each take a turn at the number-one position. Route 77, Arlington Heights-Harvard, led the morning peak and Route 73, Waverly-Harvard, the afternoon peak. Three routes that travel to

RANK	ROUTE	DIRECTION	# OF BUSES BY DIRECTION	TOTAL	BOARDINGS BY DIRECTION	TOTAL
1	77	1	220		8170	
		2	220	440	9134	17304
2	73	1	164		7525	
		2	166	330	7573	15098
3	57	1	148		5868	
		2	145	293	5828	11696
4	34	1	150		4004	
		2	142	292	4394	8398
5	39	1	147		8890	
		2	136	283	5934	8824
6	32	1	136		2896	
		2	142	278	4446	7342
7	1	1	137		9178	
		2	138	275	10042	19220
8	29	1	134		6778	
		2	130	264	6028	12806
9	23	1	109		4401	
		2	105	214	4531	8932
	71	1	105		3647	
		2	109	214	3705	7352
10	66	1	102		5119	
		2	111	213	5400	10519
11	43	1	97		4179	
		2	97	194	4289	8468
12	101	1	96		2842	
		2	97	193	3196	6038
13	22	1	94		4123	
		2	92	186	3296	7419
14	44	1	90		1615	
		2	90	180	2129	3744
15	36	1	90		2100	
		2	89	179	2236	4336
16	11	1	90		2628	
		2	88	178	2229	4857
17	15	1	91		2559	
		2	86	177	2994	5553
18	45	1	89		2371	
		2	87	176	2064	4435
19	111	1	89		2989	
		2	86	175	3160	6149
20	89	1	85		2372	
		2	89	174	2498	4870
21	304	1	82		2111	
		2	83	165	1523	3634
22	9	1		84		2758

Bus Routes Ranked by Number of Buses Run in Both Directions for the Complete Survey Day (Part 1 of 2)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit III-7

RANK	ROUTE	DIRECTION	# OF BUSES BY DIRECTION	TOTAL	BOARDINGS BY DIRECTION	TOTAL
		2	80	164	2581	5339
	87	1	82		2260	
		2	82	164	2356	4616
23	96	1	81		2234	
		2	80	161	1813	4047
24	93	1	82		2207	
		2	78	160	1915	4122
25	88	1	81		2622	
		2	76	157	2457	5079

Bus Routes Ranked by Number of Buses Run in Both Directions for the Complete Survey Day (Part 2 of 2) MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit III-7

RANK	ROUTE	DIRECTION	# OF BUSES BY DIRECTION	# OF BUSES TOTAL	BOARDINGS BY DIRECTION	BOARDINGS TOTAL
1	77	1	53		2581	
		2	54	107	1895	4476
2	73	1	37		1627	
		2	35	72	1596	3223
3	39	1	34		1973	
		2	32	68	542	2215
4	304	1	32		1283	
		2	26	58	274	1557
5	34	1	31		1310	
		2	23	54	384	1694
6	32	1	27		1025	
		2	26	53	358	1383
7	57	1	29		1705	
		2	22	51	907	2612
8	29	1	25		1654	
		2	21	46	551	2205
	300	1	26		868	
		2	20	46	239	1107
9	23	1	24		1397	
		2	21	45	771	2168
10	1	1	22		1398	
		2	21	43	1851	3249
11	20	1	21		390	
		2	18		172	
		3	2	41	37	599
	36	1	23		655	
		2	18	41	499	1154
12	66	1	19		725	
		2	20	39	1067	1729
13	101	1	20		659	
		2	18	38	517	1176
14	2	1	18		323	
		2	18	36	300	623
	11	1	19		692	
		2	17	36	168	860
15	88	1	21		874	
		2	14	35	190	1064
	301	1	20		622	
		2	15	35	91	713
16	22	1	18		992	
		2	16	34	587	1579
	89	1	18		768	
		2	16	34	449	1217
17	93	1	18		670	
		2	15	33	390	1060

Bus Routes Ranked by Number of Buses Run in Both Directions
AM Peak Period (Part 1 of 2)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit III-8

RANK	ROUTE	DIRECTION	# OF BUSES BY DIRECTION	TOTAL	BOARDINGS BY DIRECTION	TOTAL
18	71	1	17		946	1434
		2	15	32	488	
19	15	1	16		485	998
		2	15	31	513	
20	43	1	16		1007	1803
		2	15	31	823	
	96	1	18		778	980
		2	13	31	202	
	111	1	19		884	1118
		2	12	31	234	
21	47	1	13		448	1198
		2	17	30	750	
	87	1	16		688	1061
		2	14	30	373	
22	9	1	16		672	683
		2	13	29	211	
23	80	1	17		726	910
		2	12	29	184	
	109	1	15		676	997
		2	14	29	321	
24	45	1	15		687	902
		2	13	28	225	
25	26	1	14		314	
		2	13		101	415
		3	0	27	0	

Bus Routes Ranked by Number of Buses Run in Both Directions
AM Peak Period (Part 2 of 2)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit III-8

RANK	ROUTE	DIRECTION	# OF BUSES BY DIRECTION	TOTAL	BOARDINGS BY DIRECTION	TOTAL
1	77	1	33		920	
		2	32	65	2006	2926
2	73	1	29		1776	
		2	30	59	1610	3386
3	34	1	25		474	
		2	28	53	1183	1657
4	32	1	25		364	
		2	25	50	1598	1962
5	29	1	22		967	
		2	24	46	1547	2514
6	57	1	22		722	
		2	23	45	1233	1955
7	1	1	20		1666	
		2	20	40	1540	3206
8	39	1	18		1192	
		2	19	37	1215	2407
9	304	1	15		117	
		2	21	36	526	648
10	36	1	17		396	
		2	18	35	540	936
11	66	1	16		1171	
		2	17	33	1087	2258
	96	1	17		248	
		2	16	33	569	817
12	101	1	16		364	
		2	16	32	738	1102
13	87	1	15		282	
		2	16	31	607	889
	111	1	14		259	
		2	17	31	845	1104
	23	1	15		568	
		2	15	31	962	1530
14	43	1	15		649	
		2	15	30	1060	1709
	300	1	11		127	
		2	19	30	752	879
15	11	1	14		521	
		2	15	29	704	1325
	71	1	14		543	
		2	15	29	810	1353
	89	1	13		194	
		2	16	29	755	949
16	9	1	14		379	
		2	14	28	711	1090
	44	1	14		156	
		2	14	28	530	686

Bus Routes Ranked by Number of Buses Run in Both Directions
PM Peak Period (Part 1 of 3)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit III-9

RANK	ROUTE	DIRECTION	# OF BUSES BY DIRECTION	TOTAL	BOARDINGS BY DIRECTION	TOTAL
17	15	1	13		281	
		2	14	27	591	872
	93	1	14		262	
		2	13	27	450	712
18	2	1	13		236	
		2	13	26	104	340
	301	1	11		27	
		2	15	26	426	453
19	45	1	12		258	
		2	12	24	531	789
20	80	1	10		177	
		2	12	22	627	804
	88	1	10		344	
		2	12	22	728	1072
	100	1	11		53	
		2	11	22	402	455
21	22	1	11		323	
		2	10	21	469	792
	41	1	10		263	
		2	11	21	597	860
	83	1	10		253	
		2	11	21	618	871
	95	1	11		116	
		2	10	21	450	566
22	17	1	10		317	
		2	10	20	570	887
	42	1	10		89	
		2	10	20	236	325
	72	1	10		81	
		2	10	20	275	356
	109	1	10		89	
		2	10	20	449	538
23	26	1	10		142	
		2	9		313	
		3	0	19	0	455
	47	1	9		394	
		2	10	19	476	870
	51	1	9		197	
		2	10	19	389	586
	110	1	9		136	
		2	10	19	537	673
	326	1	9		3	
		2	10	19	348	351

Bus Routes Ranked by Number of Buses Run in Both Directions
PM Peak Period (Part 2 of 3)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit III-9

RANK	ROUTE	DIRECTION	# OF BUSES BY DIRECTION	# OF BUSES TOTAL	BOARDINGS BY DIRECTION	BOARDINGS TOTAL
24	16	1	9		209	
		2	9	18	363	572
	25	1	9		22	
		2	9	18	230	252
	60	1	9		268	
		2	9	18	367	635
	74	1	9		189	
		2	9	18	364	553
	78	1	9		194	
		2	9	18	391	585
25	6	1	11		500	
		2	6	17	19	519
	7	1	8		167	
		2	9	17	438	605
	10	1	8		276	
		2	9	17	362	638
	104	1	8		231	
		2	9	17	471	702
	230	1	9		328	
		2	8	17	107	435
	240	1	7		86	
		2	10	17	361	447
	325	1	7		1	
		2	10	17	322	323
	426	1	4		122	
		2	13	17	580	702

Bus Routes Ranked by Number of Buses Run
in Both Directions
PM Peak Period (Part 3 of 3)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
III-9

RANK	ROUTE	DIRECTION	NUMBER OF BUSES	BOARDINGS
1	77	1	220	8170
	77	2	220	9134
2	73	2	166	7573
3	73	1	164	7525
4	34	1	150	4004
5	57	1	148	5868
6	39	1	147	8890
7	57	2	145	5828
8	32	2	142	4446
	34	2	142	4394
9	1	2	138	10042
10	1	1	137	9178
11	32	1	136	2896
	39	2	136	5934
12	29	1	134	6778
13	29	2	130	6028
14	66	2	111	5400
15	23	1	109	4401
	71	2	109	3705
16	23	2	105	4531
	71	1	105	3647
17	66	1	102	5119
18	43	1	97	4179
	43	2	97	4289
	101	2	97	3196
19	101	1	96	2842
20	22	1	94	4123
21	22	2	92	3296
22	15	1	91	2559
23	11	1	90	2628
	36	1	90	2100
	44	1	90	1615
	44	2	90	2129

Bus Routes Ranked by Number of Buses Run in Each Direction for the Complete Survey Day (part 1 of 2)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit III-10

RANK	ROUTE	DIRECTION	NUMBER OF BUSES	BOARDINGS
24	36	2	89	2236
	45	1	89	2371
	89	2	89	2498
	111	1	89	2989
25	11	2	88	2229
39	45	2	87	2064
40	15	2	86	2994
41	20	3	86	2386
42	111	2	86	3160
43	89	1	85	2372
44	9	1	84	2758
45	304	2	83	1523
46	87	1	82	2260
47	87	2	82	2356
48	93	1	82	2207
49	304	1	82	2111
50	88	1	81	2622
51	96	1	81	2234

Bus Routes Ranked by Number of Buses Run in Each Direction for the Complete Survey Day (part 2 of 2)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit III-10

RANK	ROUTE	DIRECTION	NUMBER OF BUSES	BOARDINGS
1	77	2	54	1895
2	77	1	53	2581
3	73	1	37	1627
4	73	2	35	1596
5	39	1	34	1973
6	39	2	32	542
7	304	1	32	1283
8	34	1	31	1310
9	57	1	29	1705
10	32	1	27	1025
11	32	2	26	358
12	300	1	26	868
13	304	2	26	274
14	29	1	25	1654
15	23	1	24	1397
16	34	2	23	384
17	36	1	23	655
18	1	1	22	1398
19	57	2	22	907
20	1	2	21	1851
21	20	1	21	390
22	23	2	21	771
23	29	2	21	551
24	88	1	21	874
25	66	2	20	1067

Bus Routes Ranked by Number of Buses Run in Each Direction
AM Peak Period
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit III-11

RANK	ROUTE	DIRECTION	NUMBER OF BUSES	BOARDINGS
1	77	1	33	920
2	77	2	32	2006
3	73	2	30	1610
4	73	1	29	1776
5	34	2	28	1183
6	32	1	25	364
7	32	2	25	1598
8	34	1	25	474
9	29	2	24	1547
10	57	2	23	1233
11	29	1	22	967
12	57	1	22	722
13	304	2	21	526
14	1	1	20	1666
15	1	2	20	1540
16	39	2	19	1215
17	300	2	19	752
18	36	2	18	540
19	39	1	18	1192
20	36	1	17	396
21	66	2	17	1087
22	96	1	17	248
23	111	2	17	845
24	20	3	16	590
25	66	1	16	1171

Bus Routes Ranked by Number of Buses Run
in Each Direction
PM Peak Period
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
III-12

RANK	ROUTE	DIRECTION	# OF BUSES BY DIRECTION	# OF BUSES TOTAL	BOARDINGS BY DIRECTION	BOARDINGS TOTAL
1	1	1	137		9178	19220
		2	138	275	10042	
2	77	1	220		8170	17204
		2	220	440	9134	
3	73	1	164		7525	15098
		2	166	330	7573	
4	39	1	147		8890	14824
		2	136	283	5934	
5	29	1	134		6778	12796
		2	130	264	6028	
6	57	1	148		5868	11696
		2	145	293	5828	
7	66	1	102		5119	10519
		2	111	213	5400	
8	23	1	109		4401	8932
		2	105	214	4531	
9	43	1	97		4179	8468
		2	97	194	4289	
10	34	1	150		4004	8398
		2	142	292	4394	
11	22	1	94		4123	7419
		2	92	186	3296	
12	71	1	105		3647	7352
		2	109	214	3705	
13	32	1	136		2896	7332
		2	142	278	4446	
14	111	1	89		2989	6149
		2	86	175	3160	
15	101	1	96		2842	6038
		2	97	193	3196	
16	47	1	64		2793	5617
		2	70	134	2824	
17	15	1	91		2559	5553
		2	86	177	2994	
18	9	1	84		2758	5339
		2	80	164	2581	
19	88	1	81		2622	5079
		2	76	157	2457	
20	89	1	85		2372	4870
		2	89	174	2498	
21	11	1	90		2628	4857
		2	88	178	2229	
22	10	1	66		2322	4806
		2	67	133	2484	
23	17	1	76		2414	
24	87	1	82		2260	4616
		2	82	164	2356	
25	45	1	89		2371	4435
		2	87	175	2064	

Bus Routes Ranked by Number of Boardings
in Both Directions
for the Complete Survey Day
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
III-13

RANK	ROUTE	DIRECTION	# OF BUSES BY DIRECTION	# OF BUSES TOTAL	BOARDINGS BY DIRECTION	BOARDINGS TOTAL
1	77	1	53		2581	
		2	54	107	1895	4476
2	1	1	22		1398	
		1	21	43	1851	3249
3	73	2	37		1627	
		1	35	72	1596	3223
4	57	2	29		1705	
		1	22	51	907	2612
5	39	2	34		1973	
		1	32	66	542	2515
6	29	2	25		1654	
		1	21	46	551	2205
7	23	2	24		1397	
		1	21	45	771	2168
8	43	2	16		1007	
		1	15	31	823	1830
9	66	2	19		725	
		1	20	39	1067	1792
10	34	2	31		1310	
		1	23	54	384	1694
11	22	2	18		992	
		1	16	34	587	1579
12	304	2	32		1283	
		1	26	58	274	1557
13	71	2	17		946	
		1	15	32	488	1434
14	32	2	27		1025	
		1	26	53	358	1383
15	89	2	18		768	
		1	16	34	449	1217
16	47	2	13		448	
		1	17	30	750	1198
17	101	2	20		659	
		1	18	38	517	1176
18	36	2	23		655	
		1	18	41	499	1154
19	111	2	19		884	
		1	12	31	238	1122
20	300	2	26		868	
		1	20	46	239	1107
21	10	2	12		642	
		1	11	23	431	1073
22	88	2	21		874	
		1	14	35	190	1064
23	87	2	16		688	
		1	14	30	373	1061
24	93	2	18		670	
		1	15	33	390	1060
25	15	2	16		485	
			15	31	513	998

Bus Routes Ranked by Number of Boardings
in Both Directions
AM Peak Period
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
III-14

RANK	ROUTE	DIRECTION	# OF BUSES BY DIRECTION	# OF BUSES TOTAL	BOARDINGS BY DIRECTION	BOARDINGS TOTAL
1	73	1	29		1776	
		2	30	59	1610	3386
2	1	1	20		1666	
		2	20	40	1540	3206
3	77	1	33		920	
		2	32	65	2006	2926
4	29	1	22		967	
		2	24	46	1547	2514
5	39	1	18		1192	
		2	19	37	1215	2407
6	66	1	16		1171	
		2	17	33	1087	2258
7	32	1	25		364	
		2	25	50	1598	1962
8	57	1	22		722	
		2	23	45	1233	1955
9	43	1	15		649	
		2	15	30	1060	1709
10	34	1	25		474	
		2	28	53	1183	1657
11	23	1	15		568	
		2	15	30	962	1530
12	71	1	14		543	
		2	15	29	810	1353
13	11	1	14		521	
		2	15	29	704	1225
14	111	1	14		259	
		2	17	31	845	1104
15	101	1	16		364	
		2	16	32	738	1102
16	9	1	14		379	
		2	14	28	711	1090
17	88	1	10		344	
		2	12	22	728	1072
18	89	1	13		194	
		2	16	29	755	949
19	36	1	17		396	
		2	18	35	540	936
20	87	1	15		282	
		2	16	31	607	889

Bus Routes Ranked by Number of Boardings
in Both Directions
PM Peak Period (Part 1 of 2)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
III-15

RANK	ROUTE	DIRECTION	# OF BUSES BY DIRECTION	TOTAL	BOARDINGS BY DIRECTION	TOTAL
21	17	1	10		317	
		2	10	20	570	889
22	300	1	11		127	
		2	19	30	752	879
23	15	1	13		281	
		2	14	27	591	872
24	83	1	10		253	
		2	11	21	618	871
25	47	1	9		394	
		2	10	19	476	870

Bus Routes Ranked by Number of Boardings
in Both Directions
PM Peak Period (Part 2 of 2)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
III-15

downtown Boston during the morning rush hours move into the A.M. top 25, as one would expect. Route 36, Charles River-Arborway, is a fourth to move into the A.M.-peak group. One of the downtown-bound buses also moves into the P.M. list. Riverside-Summer & Chauncy (300) was the one route to move into both peak-period listings. In the P.M., the only other route to replace a complete-day member is Route 83, Rindge Avenue-Central Square.

The top-ranked route for any one direction of travel for the complete day was Harvard-Dudley, Route 1, with over 10,000 trips (see Exhibit III-16). Twenty-fifth on the list is Ashmont-Dudley via Talbot, with about 3,300 trips. Top-ranked for both the A.M. and P.M. peak periods was Route 77, Arlington Heights-Harvard (see Exhibits III-17 and III-18).

Average boardings per bus were calculated for all routes and the results were used to produce a ranking (see Exhibit III-19). The greatest average number of boardings was on Route 48, Boston State Hospital-Dudley, with 70 passengers per bus. This route only had two runs in each direction per day, so the significance of this ranking is somewhat diminished when considered from the point of view of demand. A close second, with 69.9 passengers per bus, was the Harvard-Dudley bus (Route 1), which had 275 runs per day. Replacement service for the Arborway Line had third place, with an average of 52.4 persons per bus. The twenty-fifth route, Watertown-Harvard (71), had 34.4 passengers per bus.

Cash revenue for each of the 25 routes with most boardings, by direction, is given in Exhibit III-20. This value reflects many factors that are difficult to evaluate, such as prepaid-pass usage and the number of fares collected other than the Basic Adult fare. The exhibit is presented to indicate that the data is available should an analyst need it.

4. Arrival Rates

During the analysis portion of this project it became necessary to fill in the bus runs not surveyed by the consultant. To do this, the arrival rates (boardings/headway) for each run were plotted by time of day. Remarkably, the shapes of these plots are quite similiar among all of the routes. Scales differ, of course, but the shape is always the familiar diurnal curve showing peaks in the morning and afternoon rush hours, with an elevated level between and sometimes a visible bump at noon. Rates were upward sloping in the early morning and downward sloping in the evening.

Sample curves are presented in Exhibits III-21 and II-8. The set of arrival-rate curves can be used to fill in passenger volumes when doing analysis in the future. Of all the data examined in the bus portion of the survey, this is most deserving of further analysis. If a relationship could be analytically confirmed between the height of the peaks and the base level, then a

RANK	ROUTE	DIRECTION	NUMBER OF BUSES	BOARDINGS
1	1	2	138	10042
2	1	1	137	9178
3	77	2	220	9134
4	39	1	147	8890
5	77	1	220	8170
6	73	2	166	7573
7	73	1	164	7525
8	29	1	134	6778
9	29	2	130	6028
10	39	2	136	5934
11	57	1	148	5868
12	57	2	145	5828
13	66	2	111	5400
14	66	1	102	5119
15	23	2	105	4531
16	32	2	142	4446
17	23	1	109	4401
18	34	2	142	4394
19	43	2	97	4289
20	43	1	97	4179
21	22	1	94	4123
22	34	1	150	4004
23	71	2	109	3705
24	71	1	105	3647
25	22	2	92	3296

Bus Routes Ranked by Number of Boardings
in Each Direction
for the Complete Survey Day
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
III-16

RANK	ROUTE	DIRECTION	NUMBER OF BUSES	BOARDINGS
1	77	1	53	2581
2	39	1	34	1973
3	77	2	54	1895
4	1	2	21	1851
5	57	1	29	1705
6	29	1	25	1654
7	73	1	37	1627
8	73	2	35	1596
9	1	1	22	1398
10	23	1	24	1397
11	34	1	31	1310
12	304	1	32	1283
13	66	2	20	1067
14	32	1	27	1025
15	43	1	16	1007
16	22	1	18	992
17	71	1	17	946
18	57	2	22	907
19	111	1	19	884
20	88	1	21	874
21	300	1	26	868
22	43	2	15	823
23	96	1	18	778
24	23	2	21	771
25	89	1	18	768

Bus Routes Ranked by Number of Boardings
in Each Direction
AM Peak Period
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
III-17

RANK	ROUTE	DIRECTION	NUMBER OF BUSES	BOARDINGS
1	77	2	32	2006
2	73	1	29	1776
3	1	1	20	1666
4	73	2	30	1610
5	32	2	25	1598
6	29	2	24	1547
7	1	2	20	1540
8	57	2	23	1233
9	39	2	19	1215
10	39	1	18	1192
11	34	2	28	1183
12	66	1	16	1171
13	66	2	17	1087
14	43	2	15	1060
15	29	1	22	967
16	23	2	15	962
17	77	1	33	920
18	111	2	17	845
19	71	2	15	810
20	89	2	16	755
21	300	2	19	752
22	101	2	16	738
23	88	2	12	728
24	57	1	22	722
25	9	2	14	711

Bus Routes Ranked by Number of Boardings
in Each Direction
PM Peak Period
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
III-18

RANK	ROUTE	DIRECTION	NUMBER OF BUSES BY DIRECTION	TOTAL	BOARDINGS BY DIRECTION	TOTAL	RATE
1	43	1	2		140		
		2	2	4	140	280	70.0
2	1	1	137		9178		
		2	138	275	10042	19220	69.9
3	39	1	147		8890		
		2	136	283	5934	14824	52.4
4	66	1	102		5119		
		2	111	213	5400	10519	49.4
5	29	1	134		6778		
		2	130	264	6028	12806	48.5
6	73	1	164		7525		
		2	166	330	7573	15098	45.8
7	43	1	97		4179		
		2	97	194	4289	8468	43.6
8	523	1	40		1525		
		2	41	81	1892	3417	42.2
9	47	1	64		2793		
		2	70	134	2824	5617	41.9
10	23	1	109		4401		
		2	105	214	4531	8932	41.7
11	531	1	18		678		
		2	16	34	685	1363	40.1
12	57	1	148		5868		
		2	145	293	5828	11696	39.9
	22	1	94		4123		
		2	92	186	3296	7419	39.9
13	58	1	17		741		
		2	16	33	571	1312	39.8
14	77	1	220		8170		
		2	220	440	9134	17304	39.3
15	137	1	8		276		
		2	8	16	331	607	37.9
16	19	1	18		735		
		2	17	35	569	1304	37.3
17	450	1	30		1051		
		2	26	56	1026	2077	37.1
18	116	1	50		1678		
		2	50	100	1994	3672	36.7
19	701	1	9		296		
		2	8	17	320	616	36.2

Bus Routes Ranked by Number of Passengers per Bus in Both Directions for the Complete Survey Day (Part 1 of 2)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit III-19

RANK	ROUTE	DIRECTION	NUMBER OF BUSES BY DIRECTION	TOTAL	BOARDINGS BY DIRECTION	TOTAL	RATE
20	10	1	66		2322		
		2	67	133	2484	4806	36.1
21	79	1	5		160		
		2	5	10	200	360	36.0
	474	2	1	1	36	36	36.0
22	35	1	45		1549		
		2	44	89	1614	3163	35.5
23	111	1	89		2989		
		2	86	175	3160	6149	35.1
24	170	1	1		52		
		2	2	3	52	104	34.7
25	71	1	105		3647		
		2	109	214	3705	7352	34.4

Bus Routes Ranked by Number of Passengers per Bus in Both Directions for the Complete Survey Day (Part 2 of 2)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

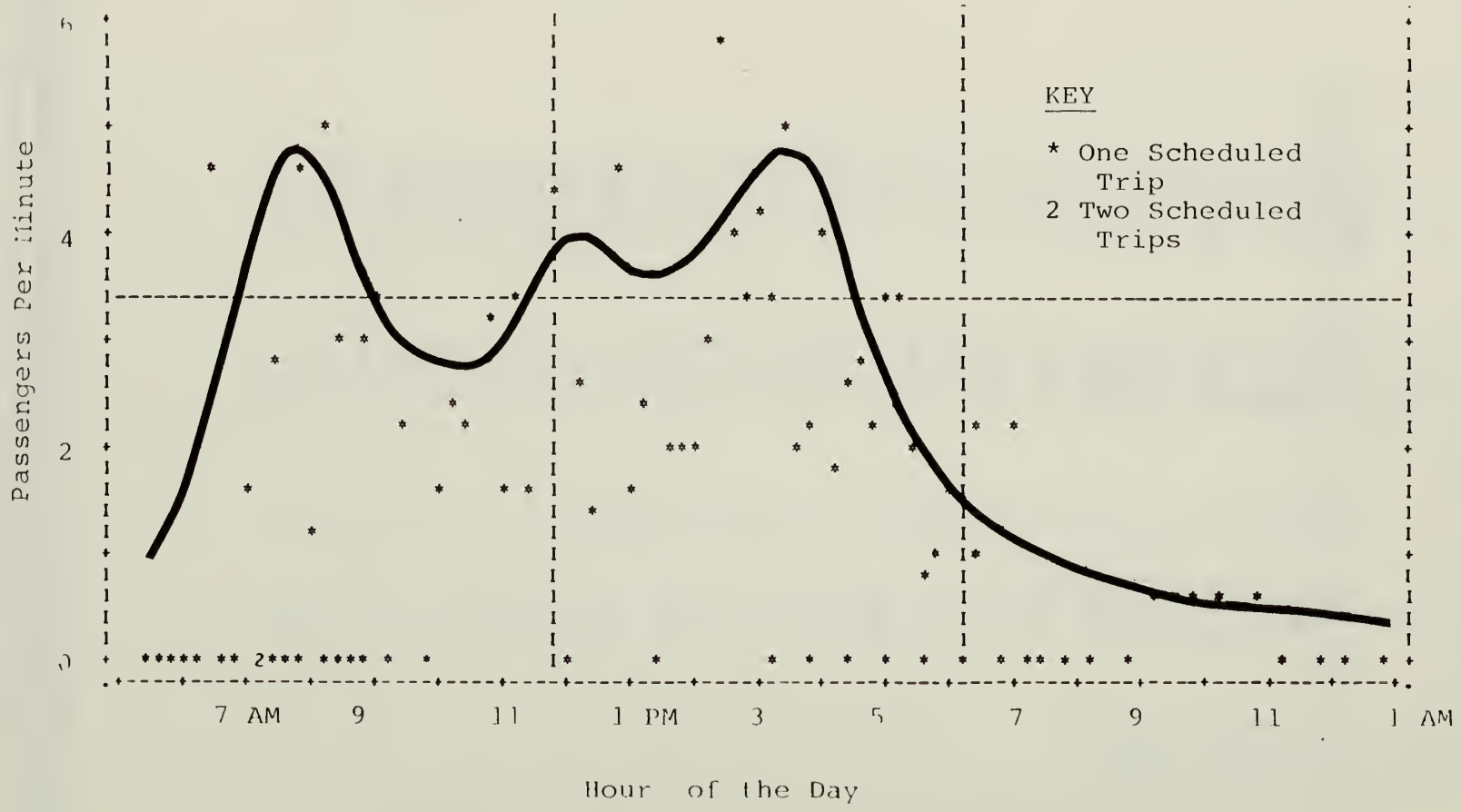
Exhibit III-19

Rte No	Dir	Boardings	Buses	Cash Revenue per Bus	Cash Revenue per Boarding
1	2	10,042	138	$14.12	$0.194
1	1	9,178	137	$13.06	$0.195
77	2	9,134	220	$7.33	$0.177
39	1	8,890	147	$9.09	$0.156
77	1	8,170	220	$6.34	$0.178
73	2	7,573	166	$8.97	$0.193
73	1	7,525	164	$8.62	$0.187
29	1	6,778	134	$8.80	$0.174
29	2	6,028	130	$7.88	$0.170
39	2	5,934	136	$6.81	$0.156
57	1	5,868	148	$7.97	$0.201
57	2	5,828	145	$8.08	$0.198
66	2	5,400	111	$8.80	$0.181
66	1	5,119	102	$9.03	$0.180
23	2	4,531	105	$6.64	$0.154
32	2	4,446	142	$5.54	$0.177
23	1	4,401	109	$6.26	$0.155
34	2	4,394	142	$5.64	$0.181
43	2	4,289	97	$8.49	$0.192
43	1	4,179	97	$7.97	$0.185
22	1	4,123	94	$7.28	$0.166
34	1	4,004	150	$4.86	$0.182
71	2	3,705	109	$6.33	$0.188
71	1	3,647	105	$6.58	$0.186
22	2	3,296	92	$6.04	$0.167

Cash Revenue of the Twenty-five Most Patronized Routes

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit III-20



Arrival Rate Plot for Route 15

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit III-21

set of factors could be developed to relate a value measured on a particular bus run to any time of day. Data collection would then be simplified and made more economical, because the MBTA could survey just a few runs of a route and then estimate peak and complete-day values. If the curves were also correlated with route length and residential density, a better tool would be available for estimating trip volumes. This would be useful for scheduling purposes, because estimates of ridership could accurately be made before a bus route is even run.

D. Boardings by Route

Complete-day, A.M.-peak and P.M.-peak boardings and bus runs are given for each bus route of the spring schedule of 1978 in Exhibit III-22. This data reflects the expansion of the collected data to cover the runs not actually surveyed. More detailed boardings by run for each route variation are readily available at CTPS in almost any aggregation desired.

E. On/Off Data for Each Route

The survey counted the number of persons getting on and off at each stop of a surveyed bus run. As with the other data items, some runs were missed. Estimates of on/off data for these runs could not be made, because, since many runs travel variant paths, no "average" could be created from the surveyed runs for an unsurveyed run. However, for the surveyed runs, this study provides more detailed data on route activity than is available from the MBTA's regular bus monitoring. This data can be used to locate the peak load point or to determine the activity at some stop of interest on the surveyed runs. Also, terminal and destination activity and the number of passengers standing and seated can be analyzed. All of this information can be found by time of day.

As with other data items, it is infeasible to include on/off information for each route in this report. Exhibit III-23 summarizes this information for the twenty-five most patronized routes. Detailed information is on file at CTPS.

ROUTE	DIRECTION	AM PEAK BOARDINGS AND BUS RUNS # PASSENGERS	AM PEAK BOARDINGS AND BUS RUNS # BUSES	PM PEAK BOARDINGS AND BUS RUNS # PASSENGERS	PM PEAK BOARDINGS AND BUS RUNS # BUSES	TOTAL DAILY BOARDINGS AND BUS RUNS # PASSENGERS	TOTAL DAILY BOARDINGS AND BUS RUNS # BUSES
TOTAL		96802	3099	83328	2576	428940	15529
1	1	1398	22	1666	20	9178	137
	2	1851	21	1540	20	10042	139
2	1	323	18	236	13	624	41
	2	300	18	104	13	427	41
6	1	213	11	500	11	1070	32
	2	198	12	19	6	381	27
7	1	320	10	167	8	1049	60
	2	358	10	438	9	1479	59
8	1	217	8	130	5	918	44
	2	170	7	178	5	1059	43
9	1	672	16	379	14	2758	84
	2	211	13	711	14	2581	80
10	1	642	12	276	8	2322	66
	2	431	11	362	9	2484	67
11	1	692	19	521	14	2629	90
	2	168	17	704	15	2229	89
12	1	11	1	0	0	11	1
13	1	65	6	32	5	131	16
	2	18	5	42	6	82	16
14	1	53	6	11	5	66	13
	2	19	5	44	6	73	13
15	1	485	16	281	13	2559	91
	2	513	15	591	14	2994	86
16	1	339	10	209	9	1332	65
	2	210	10	363	9	1359	63
17	1	526	13	317	10	2414	76
	2	404	13	570	10	2288	74

Boardings and Bus Runs by Route and Direction
AM and PM Peak Periods and
Complete Day (Part 1 of 13)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
III-22

ROUTE	DIRECTION	AM PEAK BOARDINGS AND BUS RUNS # PASSENGERS	AM PEAK BOARDINGS AND BUS RUNS # BUSES	PM PEAK BOARDINGS AND BUS RUNS # PASSENGERS	PM PEAK BOARDINGS AND BUS RUNS # BUSES	TOTAL DAILY BOARDINGS AND BUS RUNS # PASSENGERS	TOTAL DAILY BOARDINGS AND BUS RUNS # BUSES
18	1	851	41	581	41	3931	231
	2	591	41	1081	41	4621	231
19	1	5971	101	631	51	7351	181
	2	3231	101	2161	61	5691	171
20	1	3901	211	.1	01	5261	331
	2	1721	181	.1	01	2271	291
	3	371	21	5901	161	23861	861
21	1	3621	101	1321	41	8551	311
	2	3441	91	1811	41	9361	311
22	1	9921	181	3231	111	41231	941
	2	5871	161	4691	101	32961	921
23	1	13971	241	5681	151	44011	1091
	2	7711	211	9621	151	45311	1051
24	1	2221	81	121	41	4731	321
	2	1791	71	1101	41	8161	321
25	1	1591	101	221	91	4201	481
	2	1391	101	2301	91	7111	511
26	1	3141	141	1421	101	9291	561
	2	1011	131	3131	91	8831	541
	3	.1	01	.1	01	2451	151
27	1	1331	41	321	41	4771	301
	2	1071	41	771	41	4291	301
28	1	1901	61	1141	41	5131	181
	2	441	61	1631	41	3451	181
29	1	16541	251	9671	221	67781	1341
	2	5511	211	15471	241	60291	1301
30	1	1031	61	1031	41	6961	401
	2	1351	61	641	41	5411	401
31	1	2101	71	841	51	7351	461
	2	1231	71	1461	51	7901	451

Boardings and Bus Runs by Route and Direction
AM and PM Peak Periods and
Complete Day (Part 2 of 13)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
III-22

ROUTE	DIRECTION	AM PEAK BOARDINGS AND BUS RUNS # PASSENGERS	AM PEAK BOARDINGS AND BUS RUNS # BUSES	PM PEAK BOARDINGS AND BUS RUNS # PASSENGERS	PM PEAK BOARDINGS AND BUS RUNS # BUSES	TOTAL DAILY BOARDINGS AND BUS RUNS # PASSENGERS	TOTAL DAILY BOARDINGS AND BUS RUNS # BUSES
32	1	1025	27	364	25	2896	136
	2	358	26	1598	25	4446	142
33	1	130	7	51	4	499	28
	2	104	4	127	4	783	27
34	1	1310	31	474	25	4004	150
	2	384	23	1183	28	4394	142
35	1	379	9	164	7	1549	49
	2	113	7	417	7	1614	44
36	1	555	23	396	17	2100	90
	2	499	18	540	18	2236	89
37	1	359	10	117	7	1064	47
	2	113	8	280	8	1119	46
38	1	299	10	135	7	1043	52
	2	44	6	197	8	761	49
39	1	1973	34	1192	18	8890	147
	2	542	32	1215	19	5934	136
40	1	97	3	62	5	477	26
	2	61	3	95	5	462	26
41	1	360	12	263	10	1661	74
	2	312	12	597	11	2448	75
42	1	223	10	89	10	818	68
	2	115	10	236	10	1044	68
43	1	1007	16	649	15	4179	97
	2	823	15	1060	15	4289	97
44	1	581	13	156	14	1615	90
	2	212	13	530	14	2129	90
45	1	687	15	258	12	2371	89
	2	225	13	531	12	2064	87

Boardings and Bus Runs by Route and Direction
AM and PM Peak Periods and
Complete Day (Part 3 of 13)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
III-22

ROUTE	DIRECTION	AM PEAK BOARDINGS AND BUS RUNS # PASSENGERS	AM PEAK BOARDINGS AND BUS RUNS # BUSES	PM PEAK BOARDINGS AND BUS RUNS # PASSENGERS	PM PEAK BOARDINGS AND BUS RUNS # BUSES	TOTAL DAILY BOARDINGS AND BUS RUNS # PASSENGERS	TOTAL DAILY BOARDINGS AND BUS RUNS # BUSES
46	1	841	41	571	41	3251	221
	2	521	41	351	41	2741	221
47	1	4481	131	3941	91	27931	641
	2	7501	171	4761	101	28241	701
48	1	601	11	.1	01	1401	21
	2	801	11	.1	01	1401	21
49	1	451	41	71	31	1601	241
	2	321	41	311	31	1411	241
50	1	2421	71	1061	61	9841	341
	2	811	71	2571	61	8781	341
51	1	2191	81	1971	91	12201	501
	2	1751	71	3891	101	13471	501
55	1	1201	41	411	81	4211	461
	2	171	51	1281	81	4811	471
57	1	17051	291	7221	221	58691	1491
	2	9071	221	12331	231	58231	1451
58	1	5541	91	1051	71	7411	171
	2	891	51	3551	81	5711	161
59	1	731	21	451	21	2471	131
	2	751	21	401	21	2241	131
60	1	4631	111	2681	91	15871	571
	2	3851	121	3671	91	16851	571
63	1	2841	61	1221	51	10961	331
	2	2321	61	3041	61	12241	391
64	1	3931	81	1451	81	10831	491
	2	2051	81	3281	81	12701	491
65	1	3381	61	1671	51	10001	291
	2	1691	61	2191	51	9161	291

Boardings and Bus Runs by Route and Direction
AM and PM Peak Periods and
Complete Day (Part 4 of 13)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
III-22

ROUTE	DIRECTION	AM PEAK BOARDINGS AND BUS RUNS # PASSENGERS	AM PEAK BOARDINGS AND BUS RUNS # BUSES	PM PEAK BOARDINGS AND BUS RUNS # PASSENGERS	PM PEAK BOARDINGS AND BUS RUNS # BUSES	TOTAL DAILY BOARDINGS AND BUS RUNS # PASSENGERS	TOTAL DAILY BOARDINGS AND BUS RUNS # BUSES
66	1	725	19	1171	16	5119	102
	2	1067	20	1087	17	5400	111
68	1	82	8	123	6	441	32
	2	110	7	55	7	362	32
69	1	287	12	300	8	1842	73
	2	520	14	365	8	2115	74
70	1	.	0	.	0	43	3
	2	.	0	.	0	57	3
71	1	946	17	543	14	3647	105
	2	488	15	810	15	3705	109
72	1	392	11	81	10	943	66
	2	95	10	275	10	869	66
73	1	1627	37	1776	29	7525	164
	2	1596	35	1610	30	7573	166
74	1	453	11	189	9	1467	61
	2	377	12	364	9	1592	60
75	1	163	6	62	4	412	29
	2	206	8	81	3	429	30
77	1	2531	53	920	33	9170	220
	2	1895	54	2006	32	9134	220
78	1	372	9	194	9	1130	48
	2	58	9	391	9	1089	48
79	1	120	4	.	0	160	5
	2	.	0	.	0	200	5
80	1	726	17	177	10	2089	78
	2	184	12	627	12	1831	75
83	1	514	11	253	10	1991	64
	2	250	10	618	11	2303	65

Boardings and Bus Runs by Route and Direction
AM and PM Peak Periods and
Complete Day (Part 5 of 13)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
III-22

ROUTE	DIRECTION	AM PEAK BOARDINGS AND BUS RUNS		PM PEAK BOARDINGS AND BUS RUNS		TOTAL DAILY BOARDINGS AND BUS RUNS	
		# PASSENGERS	# BUSES	# PASSENGERS	# BUSES	# PASSENGERS	# BUSES
84	1	329	9	52	8	481	30
	2	45	7	354	8	718	27
85	1	224	9	35	6	437	31
	2	22	7	126	6	305	31
86	1	346	6	317	6	1320	47
	2	237	6	283	6	1323	52
87	1	688	16	282	15	2250	82
	2	373	14	607	16	2356	82
89	1	874	21	344	10	2622	91
	2	190	14	728	12	2457	76
89	1	768	18	194	13	2372	95
	2	449	16	755	16	2498	89
90	1	100	3	49	2	432	17
	2	59	4	79	3	324	17
91	1	449	12	138	7	1479	66
	2	153	11	259	7	1307	64
92	1	243	8	79	8	775	53
	2	146	8	216	8	778	52
93	1	670	18	262	14	2207	82
	2	390	15	450	13	1915	78
94	1	96	3	35	3	152	8
	2	54	2	47	2	129	8
95	1	336	11	116	11	1248	66
	2	115	10	450	10	1639	70
96	1	778	18	248	17	2234	81
	2	202	13	569	16	1813	80
97	1	144	4	35	4	325	19
	2	52	4	105	5	325	19

Boardings and Bus Runs by Route and Direction
AM and PM Peak Periods and
Complete Day (Part 6 of 13)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
III-22

ROUTE	DIRECTION	AM PEAK BOARDINGS AND BUS RUNS		PM PEAK BOARDINGS AND BUS RUNS		TOTAL DAILY BOARDINGS AND BUS RUNS	
		# PASSENGERS	# BUSES	# PASSENGERS	# BUSES	# PASSENGERS	# BUSES
99	1	342	11	107	8	899	49
	2	82	7	265	8	933	46
100	1	309	12	53	11	891	70
	2	179	12	402	11	1134	74
101	1	659	20	364	16	2842	96
	2	517	18	738	16	3196	97
104	1	506	15	231	8	1670	62
	2	322	11	471	9	1919	61
105	1	136	5	114	5	705	41
	2	167	4	175	6	792	39
106	1	575	14	94	8	1440	56
	2	277	11	335	8	1523	61
108	1	422	8	157	7	1321	47
	2	203	7	263	6	1159	43
109	1	676	15	89	10	1568	68
	2	321	14	469	10	1841	67
110	1	560	12	136	9	1443	62
	2	138	11	537	10	1457	61
111	1	884	19	259	14	2989	89
	2	238	12	845	17	3160	86
112	1	84	4	77	4	481	33
	2	85	4	52	4	347	33
116	1	469	8	170	6	1678	50
	2	397	8	424	6	1994	59
117	1	408	7	163	7	1721	52
	2	278	8	378	6	1854	54
119	3	158	6	147	5	1060	37
120	1	463	10	289	8	1893	63
	2	426	10	409	8	2239	63

Boardings and Bus Runs by Route and Direction
AM and PM Peak Periods and
Complete Day (Part 7 of 13)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
III-22

ROUTE	DIRECTION	AM PEAK BOARDINGS AND BUS RUNS		PM PEAK BOARDINGS AND BUS RUNS		TOTAL DAILY BOARDINGS AND BUS RUNS	
		# PASSENGERS	# BUSES	# PASSENGERS	# BUSES	# PASSENGERS	# BUSES
121	1	207	8	141	6	443	37
	2	66	7	171	6	456	36
130	1	117	4	77	4	416	18
	2	64	4	48	4	317	19
131	1	36	1	20	2	59	5
	2	4	1	66	3	78	5
133	1	40	2	51	2	264	9
	2	25	2	31	1	182	7
134	1	212	7	86	6	778	42
	2	201	7	233	7	1024	42
135	1	132	3	28	2	544	24
	2	113	3	127	3	600	24
136	1	61	2	16	1	220	8
	2	28	2	50	1	273	8
137	1	107	3	35	1	276	8
	2	85	2	91	2	331	5
150	1	.1	0	.1	0	5	4
	2	.1	0	.1	0	13	4
151	1	.1	0	1	1	5	4
	2	.1	0	0	1	5	3
170	1	.1	0	52	1	52	1
	2	.1	0	.1	0	52	2
210	1	84	4	108	6	509	35
	2	59	4	207	6	547	38
211	1	97	4	129	4	521	20
	2	183	4	42	4	424	19
212	1	16	2	37	2	190	13
	2	88	3	14	2	176	13

Boardings and Bus Runs by Route and Direction
AM and PM Peak Periods and
Complete Day (Part 8 of 13)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
III-22

ROUTE	DIRECTION	AM PEAK BOARDINGS AND BUS RUNS		PM PEAK BOARDINGS AND BUS RUNS		TOTAL DAILY BOARDINGS AND BUS RUNS	
		# PASSENGERS	# BUSES	# PASSENGERS	# BUSES	# PASSENGERS	# BUSES
214	1	311	101	2351	61	6171	321
	2	4721	131	521	61	8191	351
215	1	1661	81	1601	81	10391	441
	2	2391	81	2121	81	8651	441
216	1	521	111	2101	61	8161	41
	2	4591	131	411	61	6301	421
217	1	1301	51	181	41	2601	221
	2	551	41	781	41	3231	201
220	1	641	81	3901	81	11681	451
	2	4281	101	1121	61	10731	451
221	1	11	21	401	11	761	51
	2	361	21	.1	01	581	51
222	1	341	71	3811	81	9511	431
	2	3361	81	911	81	8361	431
225	1	1811	71	3531	81	13221	431
	2	3591	81	861	81	9411	441
228	1	161	21	431	21	1381	121
	2	481	21	31	21	1251	121
230	1	751	71	3281	91	9321	331
	2	3731	101	1071	81	8021	371
237	1	691	21	301	21	2681	121
	2	381	21	481	11	2201	111
238	1	1531	51	1171	41	7361	271
	2	2521	61	1201	51	7491	301
240	1	3441	121	861	71	9601	451
	2	1971	101	3611	101	12101	531
245	1	491	41	1141	41	3691	181
	2	1061	51	601	41	3111	171

Boardings and Bus Runs by Route and Direction
AM and PM Peak Periods and
Complete Day (Part 9 of 13)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
III-22

ROUTE	DIRECTION	AM PEAK BOARDINGS AND BUS RUNS # PASSENGERS	AM PEAK BOARDINGS AND BUS RUNS # BUSES	PM PEAK BOARDINGS AND BUS RUNS # PASSENGERS	PM PEAK BOARDINGS AND BUS RUNS # BUSES	TOTAL DAILY BOARDINGS AND BUS RUNS # PASSENGERS	TOTAL DAILY BOARDINGS AND BUS RUNS # BUSES
246	1	24	2	15	1	39	3
	2	0	1	15	1	15	2
270	1	.	0	.	0	8	1
	2	.	0	.	0	62	3
271	1	.	0	.	0	10	1
	2	.	0	.	0	22	1
272	1	.	0	.	0	6	1
	2	.	0	.	0	10	1
300	1	868	26	127	11	1259	51
	2	239	20	752	19	1275	53
301	1	622	20	27	11	772	41
	2	91	15	426	15	692	38
302	1	341	10	39	6	390	17
	2	64	6	233	8	323	16
303	1	86	6	25	5	112	12
	2	14	3	76	6	90	9
304	1	1283	32	117	15	2111	82
	2	274	26	526	21	1523	83
305	1	326	8	56	7	461	22
	2	25	8	301	7	424	22
325	1	310	11	1	7	337	24
	2	47	9	322	10	432	24
326	1	427	12	3	9	473	23
326	2	14	9	348	10	412	23
400	1	304	8	103	4	1021	43
	2	114	6	274	8	928	40
411	1	80	4	14	3	137	13
	2	20	4	56	4	112	13

Boardings and Bus Runs by Route and Direction
AM and PM Peak Periods and
Complete Day (Part 10 of 13)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
III-22

ROUTE	DIRECTION	AM PEAK BOARDINGS AND BUS RUNS		PM PEAK BOARDINGS AND BUS RUNS		TOTAL DAILY BOARDINGS AND BUS RUNS	
		# PASSENGERS	# BUSES	# PASSENGERS	# BUSES	# PASSENGERS	# BUSES
412	1	.	0	.	0	68	5
	2	.	0	.	0	30	5
426	1	554	16	122	4	1177	36
	2	1091	6	580	13	1173	40
428	1	26	3	48	3	241	16
	2	47	4	15	1	198	15
429	1	8	1	44	3	175	13
	2	110	4	7	1	226	13
430	1	249	7	42	6	576	36
	2	53	8	131	6	604	35
431	1	.	0	2	1	24	5
	2	16	3	.	0	23	6
432	1	68	4	99	4	353	19
	2	117	4	31	5	343	19
433	1	10	3	36	3	161	15
	2	29	4	8	3	109	15
435	1	80	4	68	4	446	23
	2	59	4	78	5	334	25
436	1	29	2	41	2	249	16
	2	76	3	10	2	283	16
437	1	17	3	66	4	238	20
	2	76	4	6	4	263	21
439	1	12	3	49	3	132	14
	2	39	4	7	2	94	16
440	1	307	8	79	6	879	36
	2	106	6	500	8	1217	34
441	1	110	4	62	3	374	17
	2	179	4	93	5	555	19

Boardings and Bus Runs by Route and Direction
AM and PM Peak Periods and
Complete Day (Part 11 of 13)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
III-22

ROUTE	DIRECTION	AM PEAK BOARDINGS AND BUS RUNS		PM PEAK BOARDINGS AND BUS RUNS		TOTAL DAILY BOARDINGS AND BUS RUNS	
		# PASSENGERS	# BUSES	# PASSENGERS	# BUSES	# PASSENGERS	# BUSES
442	1	148	4	152	3	680	26
	2	128	3	27	2	474	25
443	1	.	0	2	1	2	2
	2	.	0	.	0	15	1
450	1	471	11	58	3	1051	30
	2	351	2	646	12	1026	26
451	1	79	4	40	3	269	16
	2	62	3	50	3	256	16
453	1	0	1	2	1	15	5
	2	4	1	0	1	5	5
454	1	8	1	13	1	85	9
	2	10	1	3	1	49	6
455	1	92	5	67	4	859	33
	2	129	4	75	4	774	31
456	1	67	6	47	3	143	16
	2	65	4	20	5	179	17
457	1	.	0	5	1	19	5
	2	.	0	1	1	9	5
458	1	6	1	25	3	85	9
	2	31	2	5	2	92	9
461	1	.	0	.	0	47	7
	2	.	0	.	0	53	7
462	1	.	0	.	0	47	4
	2	.	0	.	0	12	4
463	1	.	0	.	0	26	3
	2	.	0	.	0	19	3
468	1	167	2	30	2	222	7
	2	16	3	7	2	36	8
520	1	111	3	46	2	357	14
	2	41	2	74	2	288	14

Boardings and Bus Runs by Route and Direction
AM and PM Peak Periods and
Complete Day (Part 12 of 13)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
III-22

ROUTE	DIRECTION	AM PEAK BOARDINGS AND BUS RUNS		PM PEAK BOARDINGS AND BUS RUNS		TOTAL DAILY BOARDINGS AND BUS RUNS	
		# PASSENGERS	# BUSES	# PASSENGERS	# BUSES	# PASSENGERS	# BUSES
521	1	1031	21	821	21	3111	121
	2	491	21	781	21	2771	131
522	1	751	31	381	21	2861	161
	2	441	21	591	21	2851	141
523	1	2591	61	2641	51	15251	401
	2	2811	51	3931	61	18921	411
525	1	511	21	121	11	1871	121
	2	231	21	481	21	1771	121
527	1	611	41	571	41	2241	181
	2	971	41	561	41	2741	171
528	1	1581	41	541	31	3971	211
	2	1031	31	1241	41	5001	181
529	1	1021	51	681	31	4101	241
	2	711	31	601	41	3721	241
530	1	631	21	151	21	1021	71
	2	181	21	331	21	801	71
531	1	1671	41	1301	31	6781	191
	2	621	21	1361	31	6951	161
532	1	1481	31	1241	31	5861	171
	2	1401	31	1201	31	5471	171
533	1	1681	51	731	41	6041	271
	2	1691	51	1461	41	6561	271
590	1	.1	01	51	11	1631	141
	2	.1	01	121	21	1401	141
595	3	.1	01	111	11	3031	151
700	1	2361	61	211	21	5391	191
	2	311	21	2741	71	5351	201
701	1	2901	81	.1	01	2961	81
	2	.1	01	3201	81	3201	81
SPEC-IAL RUNS	1	171	51	1671	221	4331	1001
	2	491	251	731	101	3721	1011

Boardings and Bus Runs by Route and Direction
AM and PM Peak Periods and
Complete Day (Part 13 of 13)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
III-22

Rte No	Dir	Peaking Factor	% Boardings at Terminal	% Alightings at Terminal	Peak Load Point
1	2	2.10	31%	27%	Mass Ave & Beacon St
1	1	2.10	32%	26%	Mass Ave & Sydney St
77	2	1.65	57%	17%	Mass Ave & Beach St
39	1	1.75	35%	31%	S Huntington Ave & VA Hospital
77	1	1.50	12%	57%	Mass Ave & Harvey St
73	2	1.40	23%	35%	Mount Auburn St & Brewster St
73	1	1.90	17%	36%	Mount Auburn St & Maynard Place
29	1	1.75	10%	48%	Esmond St & Blue Hill Ave
29	2	1.50	56%	17%	Charlotte St & Blue Hill Ave
39	2	1.65	35%	1%	S Huntington Ave & VA Hospital
57	1	1.60	15%	48%	Brighton Ave & Commonwealth Ave
57	2	1.70	47%	18%	Commonwealth Ave & Babcock St
66	2	1.95	51%	15%	Dudley Station
66	1	1.85	12%	42%	Columbus Ave & Roxbury St
23	2	1.55	63%	16%	St James St & Warren St
32	2	1.25	24%	20%	Hyde Park Ave & Walk Hill St
23	1	1.55	20%	48%	Gaston St & Warren St
34	2	1.40	19%	10%	Washington St & Archdale Rd
43	2	1.75	43%	25%	Tremont St & Patterson
43	1	2.05	31%	31%	Tremont St & Waltham St
22	1	1.50	15%	43%	Warren St & Gaston St
34	1	1.45	15%	17%	Washington St & Whipple Ave
71	2	1.40	65%	21%	Mount Auburn St & Elmwood Ave
71	1	1.50	35%	12%	Mount Auburn St & Sparks
22	2	1.65	60%	15%	Warren St & St James St

Peak-Load Information for the
Twenty-five Most Patronized Routes

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
III-23

IV. PASSENGER QUESTIONNAIRE SURVEY RESULTS

A. Introduction

Characteristics of the people who ride the bus system were determined using a self-administered questionnaire. On each route a questionnaire was handed out to as many riders as possible. Riders filled them out and returned them to Wilbur Smith and Associates. After they were edited for errors, the surveys were factored up to the boarding-control totals to produce the final results. Selected statistics have been summarized for this report by garage, class of route, and time period, as well as at the systemwide level. All questionnaire data can be compiled at the route level when needed.

B. Socioeconomic Characteristics of Passengers

Various tables and graphs are presented in this section to display socioeconomic data from the questionnaire survey. Some comparisons are made to similiar statistics for the Boston SMSA and from the rail portion of the 1978 Passenger Survey.

1. Systemwide Summary of Socioeconomic Characteristics of Passengers

The following are some generalizations that can be made about the systemwide bus ridership, based on data derived from the returned questionnaires.

- Two thirds of all riders were female, a much greater proportion than in the population of the Boston SMSA or the ridership of the rail portion of the system.

- Two thirds of all riders were between the ages of 16 and 44 years old, a smaller proportion than in the rail ridership, in part because bus riders were twice as likely to be 65 or older.

- As with the rail ridership, most riders were either employed or students, but the ratio was slightly less than the nine of ten in the rail system. In turn, the bus rider was twice as likely to be retired or unemployed and almost twice as likely to be a housewife as the rail rider.

- As with the rail ridership, over one half of the bus riders earned less than $15,000.

- Fully one third of all bus riders did not have an automobile, and they were less likely to come from a household that has two automobiles than the average SMSA resident.

- Two fifths of the riders had driver's licenses.

- Riders are less likely to come from a larger sized household than the general SMSA population. Over one half come from households of three or less.

The differences between bus and rail riders on the MBTA will be further illustrated and analyzed in the following sections examining particular characteristics.

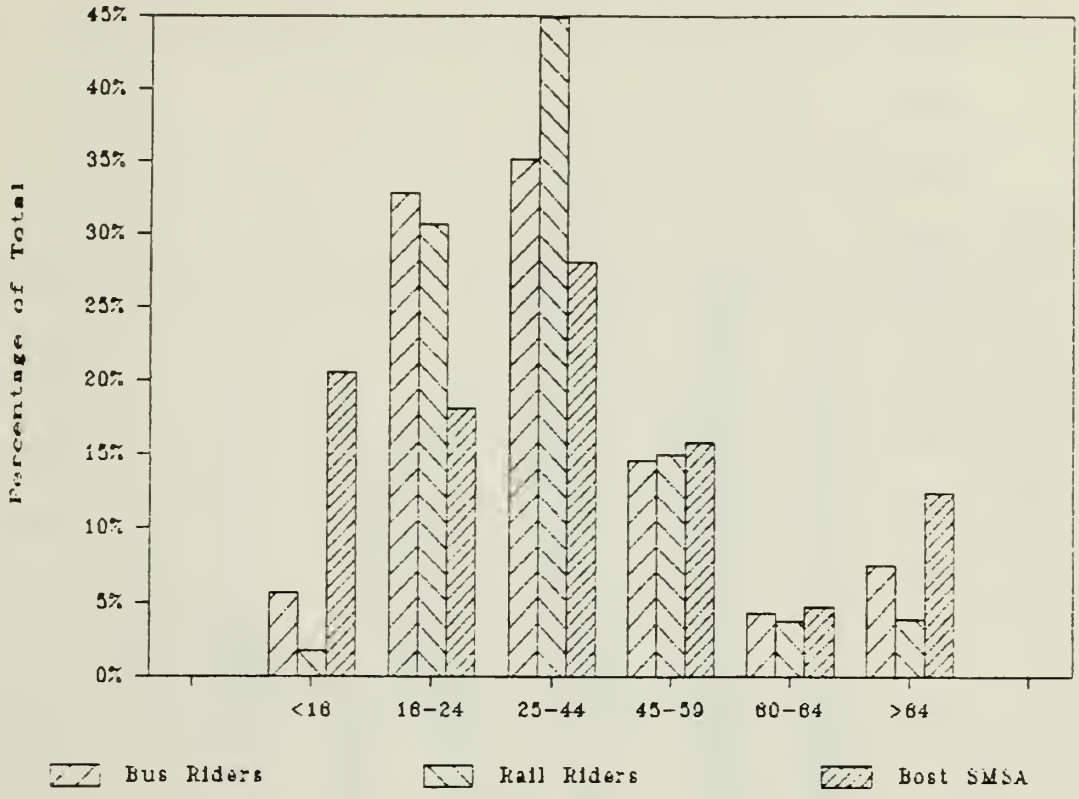
2. Age

A general age distribution for the bus riders is presented in Exhibit IV-1, with distributions from the rail survey and for the Boston SMSA. A greater proportion of riders was below 16 years of age, compared to the rail survey, and the proportion between 16 and 24 was also somewhat greater. These differences are in part due to a more technically sophisticated processing technique having been used for the bus results, but there was clearly a greater percentage of younger people riding the bus system than the rail. Another evidence of this, as we shall see later, is that student fares were collected almost five times as frequently on the bus system.

In the rail report, a comparison of the riders to the general population was made excluding the riders under 16 years old. It was reasoned that a disproportionate number of these people did not report because they could not fill out a form or did not choose to. Although more riders under 16 years old returned bus questionnaires, this mode of comparison is continued (see Exhibit IV-2).

Bus riders were generally younger than people in the general population and rail riders. Although the overwhelming majority of bus riders were in the 16-to-44-year-old range, they are more plentiful at the lower end of that bracket. However, senior citizens were almost twice as large a segment of the bus riders as of the rail, notwithstanding the general youthfulness of the bus population. Yet, this segment still was only about one half as large, proportionally, as the senior-citizen segment of the Boston SMSA population.

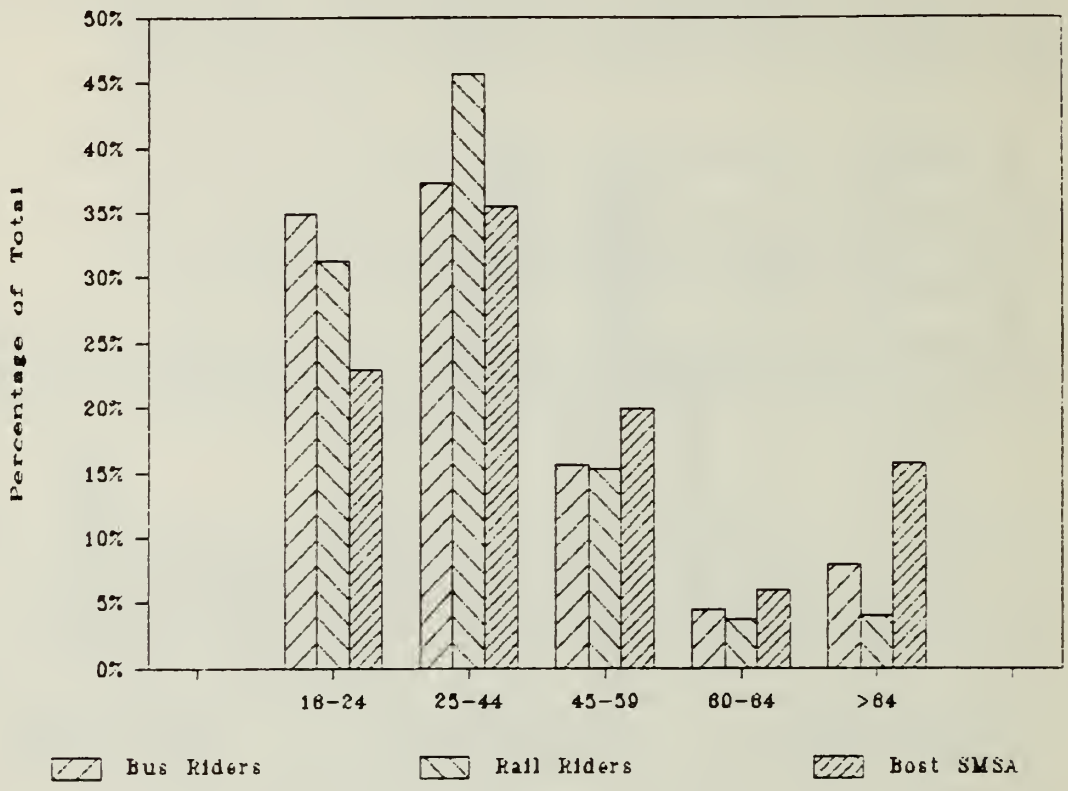
Crosstabulations of age by garage, class of route and time period of the day appear as Exhibits IV-3 to IV-8. The greatest percentage and number of young riders was on the Arborway routes. Commuter routes had the greatest percentage of 25-44-year-olds. Suburban routes had the greatest percentage of elderly. The mid-day period (12:00 noon to 4:00 P.M.) had the greatest percentage



	BUS SURVEY Riders	BUS SURVEY Percent	RAIL SURVEY Riders	RAIL SURVEY Percent	BOSTON SMSA Persons	BOSTON SMSA Percent
<16	23,806	5.6%	6,170	1.7%	570,742	20.7%
16-24	140,950	32.9%	110,292	30.8%	503,268	18.2%
25-44	151,072	35.2%	160,898	44.9%	776,767	28.1%
45-59	62,754	14.6%	53,805	15.0%	437,567	15.8%
60-64	18,230	4.3%	13,263	3.7%	130,413	4.7%
>64	32,128	7.5%	14,003	3.9%	344,600	12.5%
Total	428,940	100.0%	358,431	100.0%	2,763,357	100.0%

Comparison of Age Distributions
Including Respondents Under 16 Years Old
Rail and Bus Surveys and Boston SMSA
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

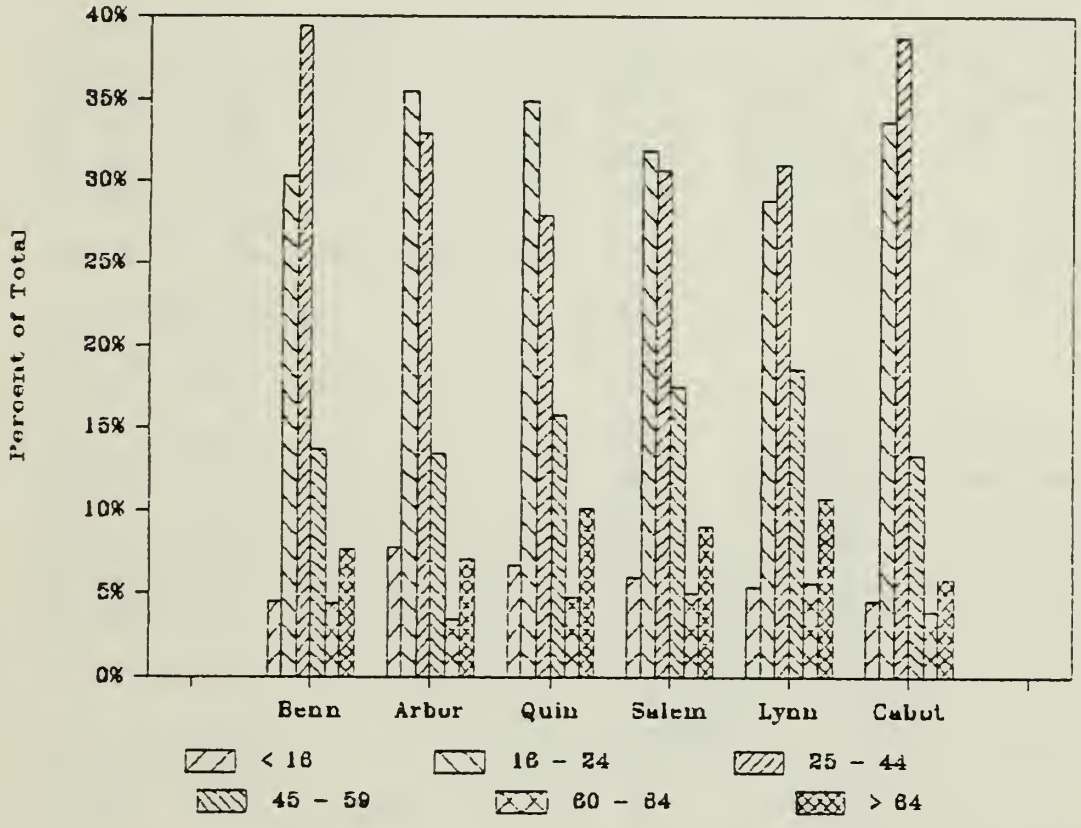
Exhibit
IV-1



	BUS SURVEY		RAIL SURVEY		BOSTON SMSA	
	Riders	Percent	Riders	Percent	Persons	Percent
16-24	140,950	34.8%	110,292	31.3%	503,268	23.0%
25-44	151,072	37.3%	160,898	45.7%	776,767	35.4%
45-59	62,754	15.5%	53,805	15.3%	437,567	20.0%
60-64	18,230	4.5%	13,263	3.8%	130,413	5.9%
>64	32,128	7.9%	14,003	4.0%	344,600	15.7%
Total	405,134	100.0%	352,261	100.0%	2,192,615	100.0%

Comparison of Age Distributions
Without Respondents Under 16 Years Old
Rail and Bus Surveys and Boston SMSA
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
IV-2



Distribution of Riders by Age
by Garage (Graph)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
IV-3

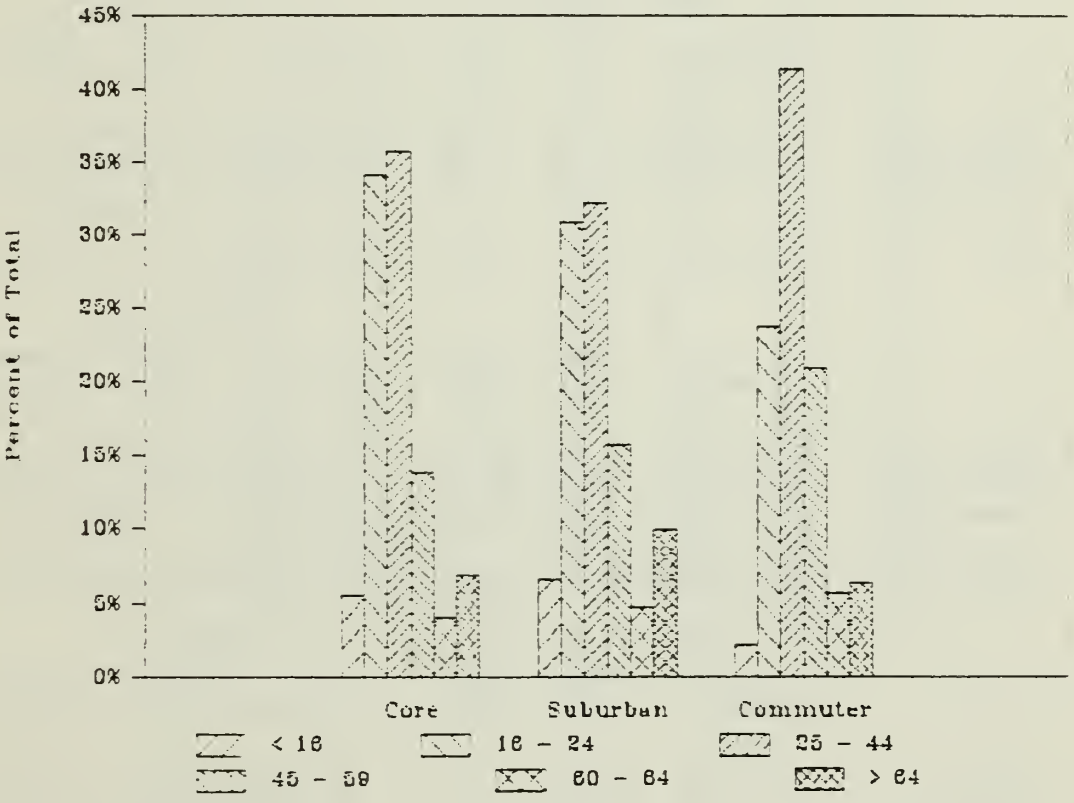
	UNDER 16			16-24 YRS		
	Riders	Age Pct	Garage Pct	Riders	Age Pct	Garage Pct
Bennett St	3,645	15.3%	4.5%	24,525	17.4%	30.3%
Arborway	6,297	26.5%	7.7%	28,923	20.5%	35.4%
Quincy	1,635	6.9%	6.7%	8,513	6.0%	34.8%
Salem St	4,852	20.4%	6.0%	25,907	18.4%	31.9%
Lynn	1,095	4.6%	5.3%	5,948	4.2%	28.8%
Cabot	6,282	26.4%	4.5%	47,134	33.4%	33.7%
Total	23,806	100.0%	5.6%	140,950	100.0%	32.9%

	25-44 YRS			45-59 YRS		
	Riders	Age Pct	Garage Pct	Riders	Age Pct	Garage Pct
Bennett St	31,952	21.2%	39.4%	11,139	17.8%	13.7%
Arborway	26,831	17.8%	32.9%	11,020	17.6%	13.5%
Quincy	6,828	4.5%	27.9%	3,853	6.1%	15.7%
Salem St	24,882	16.5%	30.6%	14,176	22.6%	17.5%
Lynn	6,405	4.2%	31.0%	3,834	6.1%	18.6%
Cabot	54,175	35.9%	38.7%	18,732	29.9%	13.4%
Total	151,073	100.0%	35.2%	62,754	100.0%	14.6%

	60-64 YRS			>64 YRS		
	Riders	Age Pct	Garage Pct	Riders	Age Pct	Garage Pct
Bennett St	3,562	19.5%	4.4%	6,197	19.3%	7.6%
Arborway	2,787	15.3%	3.4%	5,738	17.9%	7.0%
Quincy	1,169	6.4%	4.8%	2,480	7.7%	10.1%
Salem St	4,036	22.1%	5.0%	7,376	23.0%	9.1%
Lynn	1,156	6.3%	5.6%	2,207	6.9%	10.7%
Cabot	5,520	30.3%	3.9%	8,130	25.3%	5.8%
Total	18,230	100.0%	4.3%	32,128	100.0%	7.5%

Distribution of Riders by Age
by Garage (Table)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
IV-4



Distribution of Riders by Age
by Route Class (Graph)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
IV-5

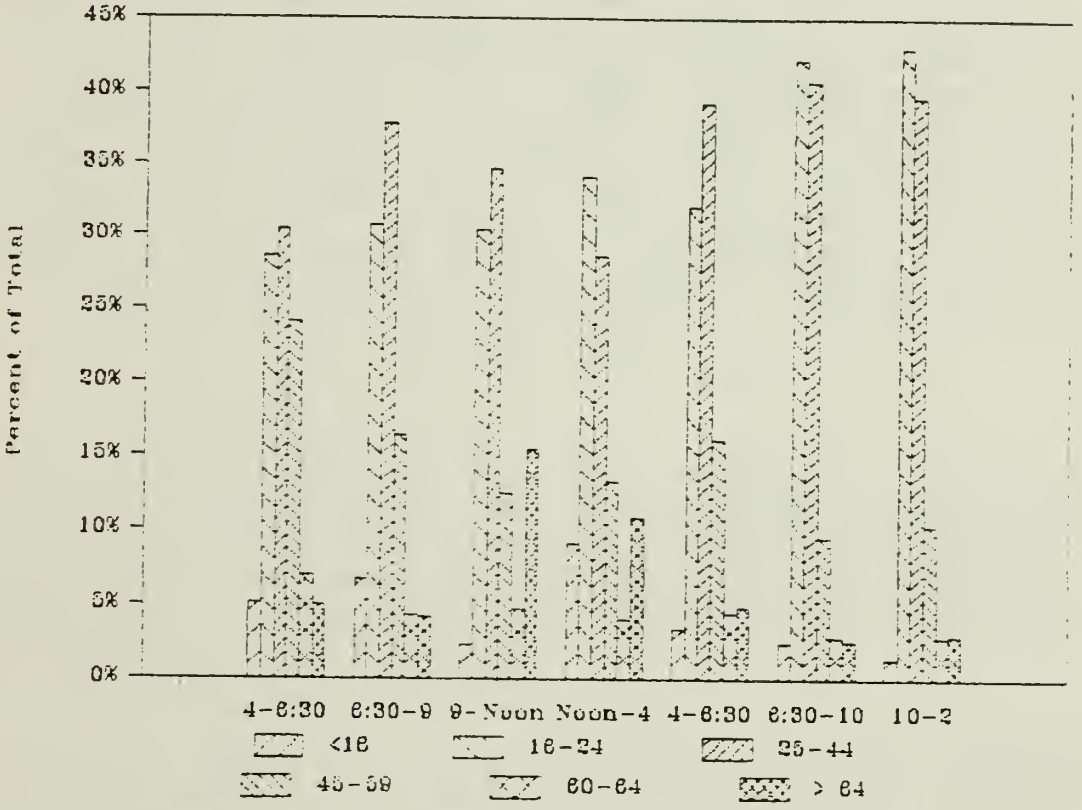
	LESS THAN 16			16 - 24		
	Riders	Age Pct	Class Pct	Riders	Age Pct	Class Pct
Core	17,178	72.2%	5.5%	106,502	75.6%	34.1%
Suburban	6,159	25.9%	6.5%	29,148	20.7%	30.9%
Commuter	469	2.0%	2.1%	5,300	3.8%	23.7%
Total	23,806	100.0%	5.6%	140,950	100.0%	32.9%

	25 - 44			45 - 59		
	Riders	Age Pct	Class Pct	Riders	Age Pct	Class Pct
Core	111,431	73.8%	35.7%	43,244	68.9%	13.9%
Suburban	30,381	20.1%	32.2%	14,841	23.7%	15.7%
Commuter	9,261	6.1%	41.4%	4,669	7.4%	20.9%
Total	151,073	100.0%	35.2%	62,754	100.0%	14.6%

	60 - 64			OVER 64		
	Riders	Age Pct	Class Pct	Riders	Age Pct	Class Pct
Core	12,496	68.6%	4.0%	21,355	66.5%	6.8%
Suburban	4,465	24.5%	4.7%	9,359	29.1%	9.9%
Commuter	1,269	7.0%	5.7%	1,414	4.4%	6.3%
Total	18,230	100.0%	4.3%	32,128	100.0%	7.5%

Distribution of Riders by Age
by Route Class (Table)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
IV-6



Distribution of Riders by Age
by Time Period (Graph)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
IV-7

	UNDER 16			16-24 YRS		
	Riders	Age Pct	Time Pct	Riders	Age Pct	Time Pct
4-6:30am	671	2.7%	5.1%	3,566	2.5%	28.6%
6:30-9am	7,420	31.2%	6.7%	34,166	24.2%	30.8%
9am-Noon	1,283	5.4%	2.2%	17,337	12.3%	30.4%
Noon-4pm	10,449	43.9%	9.1%	39,058	27.7%	34.1%
4-6:30pm	3,216	13.5%	3.4%	30,402	21.6%	32.0%
6:30-10pm	667	2.8%	2.4%	11,938	8.5%	42.1%
10pm-2am	140	0.6%	1.3%	4,482	3.2%	41.0%
Total	23,806	100.0%	5.6%	140,950	100.0%	32.9%

	25-44 YRS			45-59 YRS		
	Riders	Age Pct	Time Pct	Riders	Age Pct	Time Pct
4-6:30am	3,792	2.5%	70.4%	3,006	4.8%	24.1%
6:30-9am	41,883	27.7%	37.7%	10,174	29.0%	16.4%
9am-Noon	19,750	13.1%	24.6%	7,154	11.4%	12.5%
Noon-4pm	32,763	21.7%	28.6%	15,318	24.4%	13.4%
4-6:30pm	37,224	24.6%	39.2%	15,312	24.4%	16.1%
6:30-10pm	11,502	7.6%	40.7%	2,717	4.3%	9.6%
10pm-2am	4,124	2.7%	39.6%	1,072	1.7%	10.3%
Total	151,073	100.0%	35.3%	62,754	100.0%	14.6%

	60-64 YRS			OVER 64 YRS		
	Riders	Age Pct	Time Pct	Riders	Age Pct	Time Pct
4-6:30am	868	4.8%	7.0%	617	1.9%	4.9%
6:30-9am	4,786	26.3%	4.3%	4,604	14.3%	4.1%
9am-Noon	2,704	14.8%	4.7%	8,845	27.5%	15.4%
Noon-4pm	4,565	25.0%	4.0%	12,498	38.9%	10.9%
4-6:30pm	4,226	23.2%	4.5%	4,556	14.2%	4.8%
6:30-10pm	793	4.4%	2.8%	700	2.2%	2.5%
10pm-2am	288	1.6%	2.8%	308	1.0%	3.0%
Total	18,230	100.0%	4.3%	32,128	100.0%	7.6%

Distribution of Riders by Age
by Time Period (Table)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
IV-8

of young riders of all the time periods of the day. Senior citizens rode most frequently between 9:00 A.M. and 12:00 noon.

3. Sex

Females made up a much greater portion of the bus riders (about 66 percent) than of the rail riders (about 55 percent) or the general population (about 53 percent), which had similar proportions. The pronounced difference is displayed in Exhibit IV-9. Two other distributions were computed with respect to sex for the report. Sex by class of route is presented in Exhibit IV-10. Almost seven out of ten riders traveling on routes within the core area were female. The percentage of female riders was smaller on suburban runs and least on commuter routes. The second distribution shows sex by time period of the day (see Exhibit IV-11). The ridership was 66-percent female between 6:30 A.M. and 6:30 P.M. Before 6:30 A.M. and between 6:30 and 10:00 P.M., 60 percent of the riders were female. Interestingly, after 10:00 P.M. the split is exactly like that of the general population.

4. Occupation

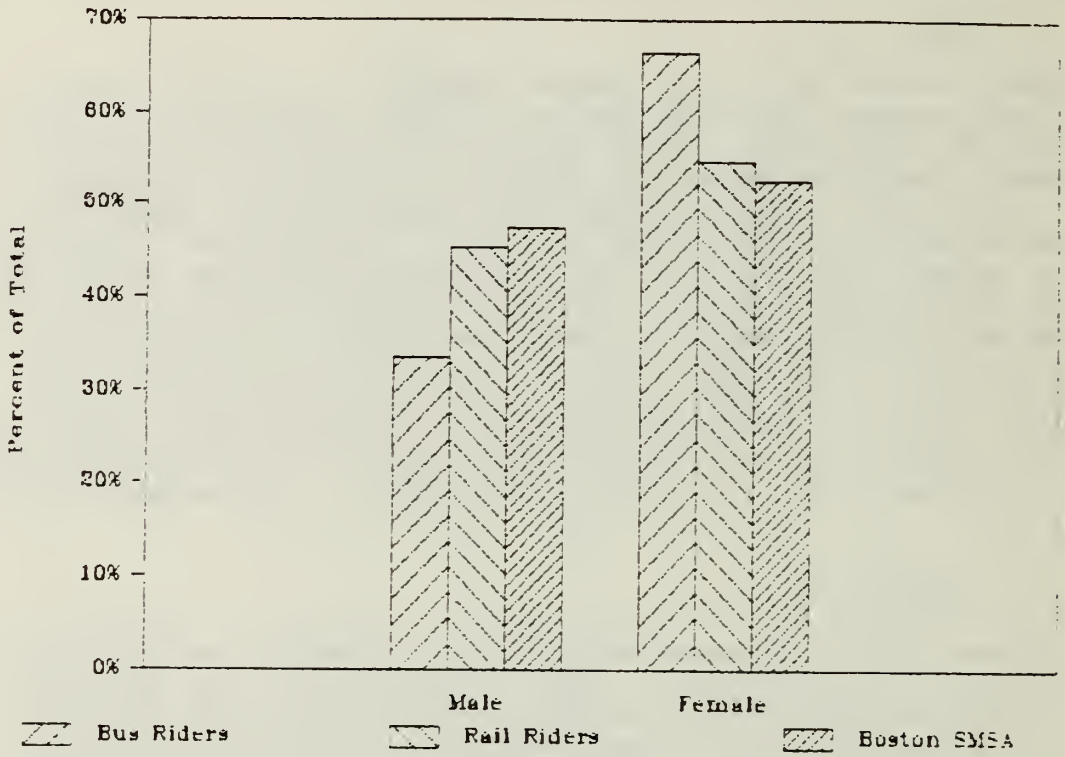
Six categories of occupation were listed on the questionnaire for riders to choose among. The bus population was much different from the rail with respect to occupation (see Exhibit IV-12). A bus rider was about 8-percent less likely to be employed than a rail passenger and 2-percent less likely to be a college student. There was twice as great a chance that the rider was retired or a housewife.

Two tables which list the frequencies of occurrence of the various occupations are presented in Exhibit IV-13. Comparison between the bus and the SMSA population is not possible because some categories could not be found for the SMSA.

5. Household Size

Dramatic changes have been occurring in the household sizes of the general population. The proportion of households of six or more is less than half as large in 1980 as in 1970. At the same time, the proportion of households of one increased sharply. Comparison of the rail-rider characteristics with the 1980 census results, which were not available for the rail report, shows that the proportion of rail riders from households of three or more was smaller than that for the general population, while the proportions of riders from single- and two-person households were larger than those for the general population. Larger households must depend on the MBTA less to provide mobility since they are more likely to have automobiles.

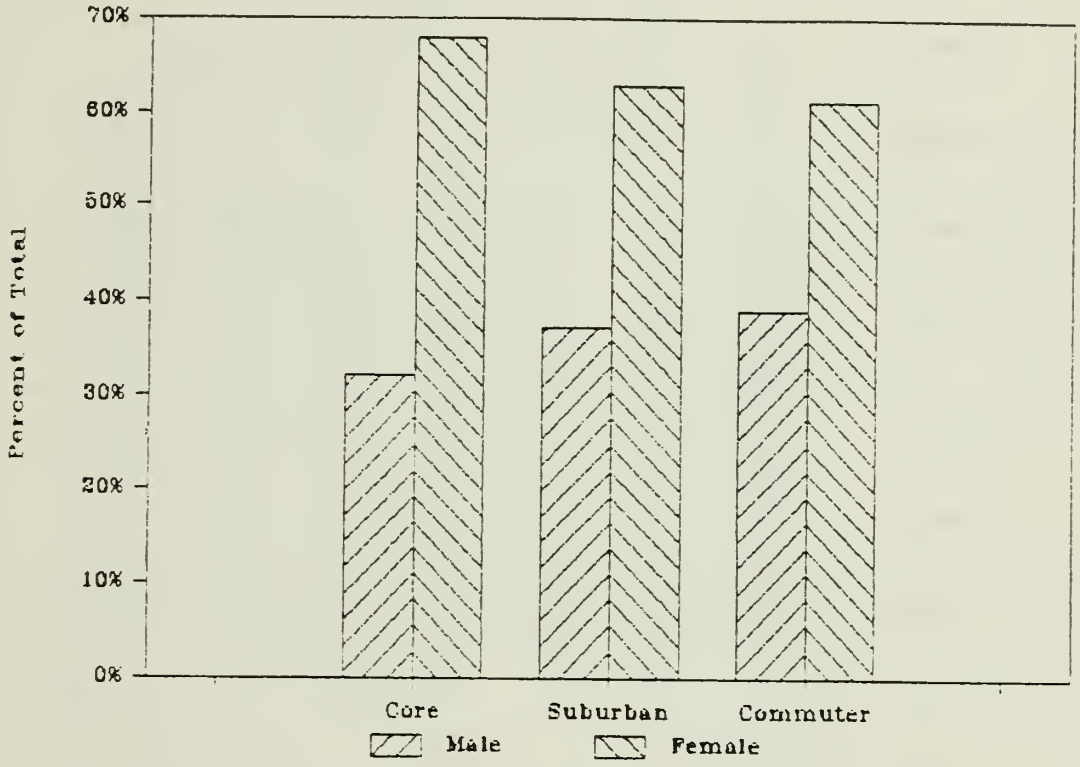
Household size for bus riders also reflects this fact. Even more bus riders than rail riders were from households in the largest category of size.



	BUS SURVEY		RAIL SURVEY		BOSTON SMSA	
	Riders	Percent	Riders	Percent	Persons	Percent
Male	143,738	33.5%	159,158	45.2%	1,309,538	47.4%
Female	285,202	66.5%	192,841	54.8%	1,453,819	52.6%
Total	428,940	100.0%	351,999	100.0%	2,763,357	100.0%

Comparison of Distributions by Sex
for Rail and Bus Surveys and Boston SMSA
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
IV-9

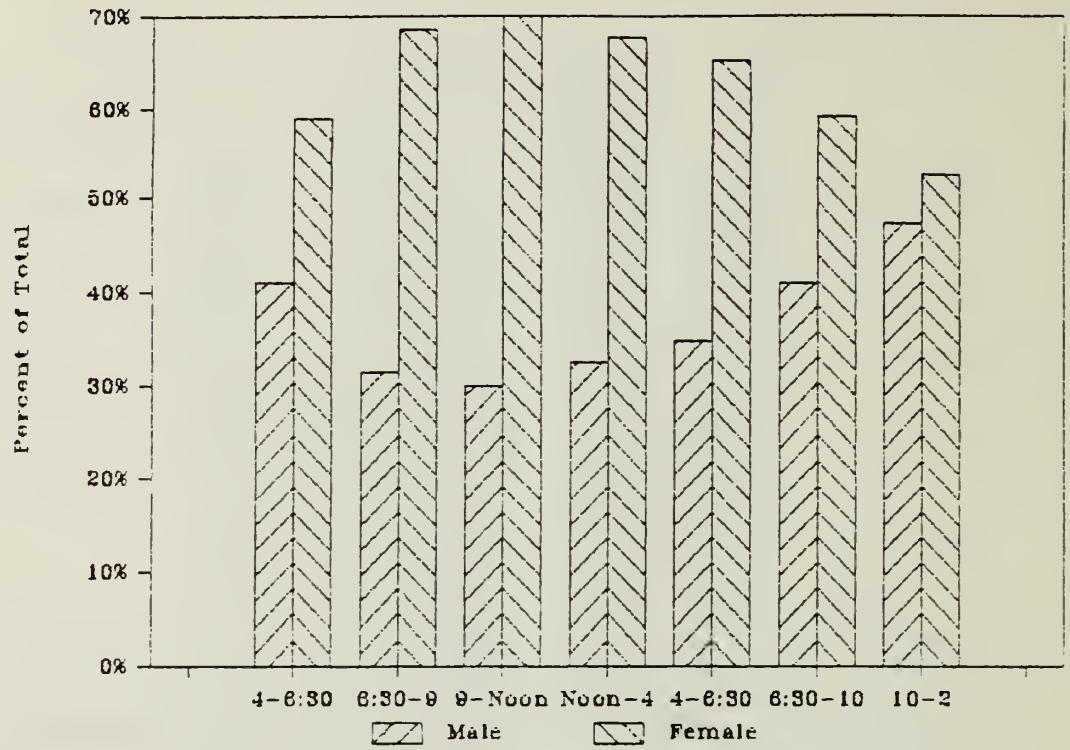


	MALE			FEMALE		
	Riders	Sex Pct	Class Pct	Riders	Sex Pct	Class Pct
Core	99,826	69.5%	32.0%	211,905	74.3%	68.0%
Suburban	35,115	24.4%	37.1%	59,465	20.9%	62.9%
Commuter	8,797	6.1%	38.9%	13,832	4.9%	61.1%
Total	143,738	100.0%	33.5%	285,202	100.0%	66.5%

Distribution of Riders by Sex
by Route Class

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
IV-10

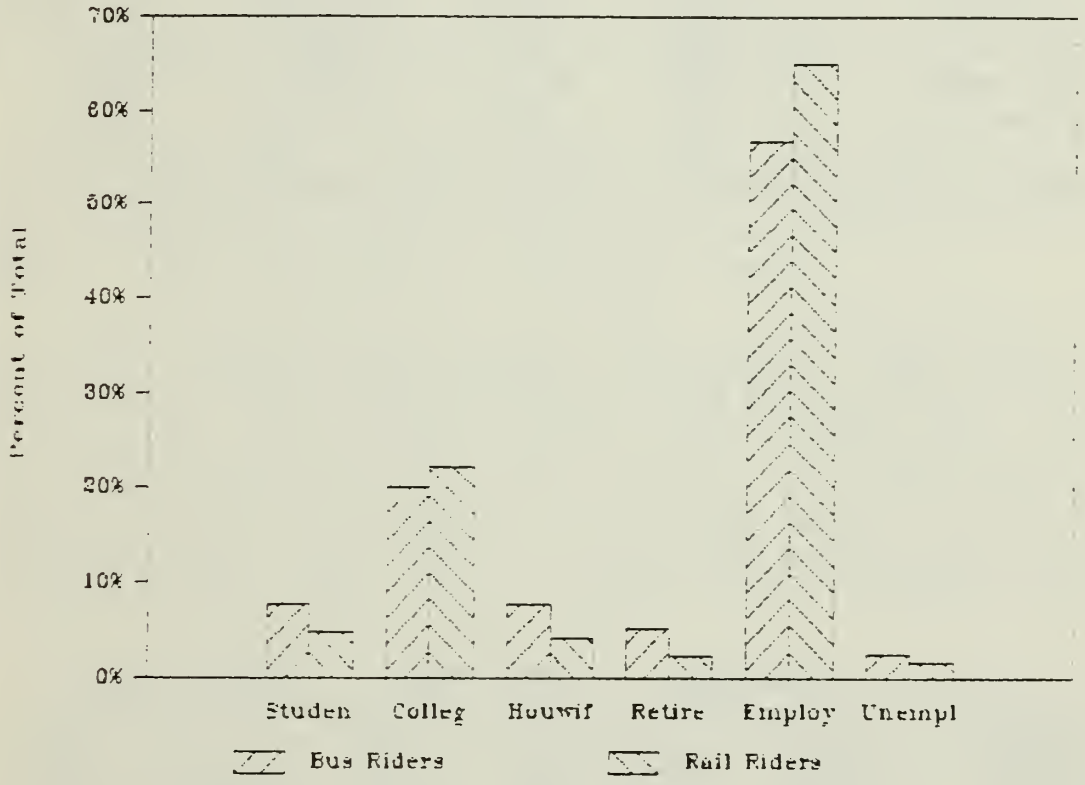


	MALE			FEMALE		
	Riders	Sex Pct	Time Pct	Riders	Sex Pct	Time Pct
4-6:30am	5,088	3.5%	41.1%	7,301	2.6%	58.9%
6:30-9am	34,957	24.3%	31.4%	76,406	26.8%	68.6%
9am-Noon	17,047	11.9%	30.0%	39,757	13.9%	70.0%
Noon-4pm	37,070	25.8%	32.4%	77,460	27.2%	67.6%
4-6:30pm	33,074	23.0%	34.7%	62,146	21.8%	65.3%
6:30-10pm	11,672	8.1%	41.0%	16,770	5.9%	59.0%
10pm-2am	4,830	3.4%	47.4%	5,362	1.9%	52.6%
Total	143,738	100.0%	33.5%	285,202	100.0%	66.5%

Distribution of Riders by Sex
by Time Period

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
IV-11



Comparison of Occupations
for Persons Over 16 Years of Age
for Rail and Bus Surveys (Graph)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
IV-12

	BUS SURVEY Riders	BUS SURVEY Percent	BOSTON SMSA Persons	BOSTON SMSA Percent
Student	54,561	12.7%	572,689	24.2%
College	81,070	18.9%	239,693	10.1%
Housewife	31,613	7.4%	150,239	6.3%
Retired	21,104	4.9%	NA	NA
Employed	230,469	53.7%	1,342,491	56.7%
Unemployed	10,123	2.4%	63,081	2.7%
Total	428,940	100.0%	2,368,193	100.0%

	BUS SURVEY Riders	BUS SURVEY Percent	RAIL SURVEY Riders	RAIL SURVEY Percent	BOSTON SMSA Persons	BOSTON SMSA Percent
Student	31,155	7.7%	16,721	4.8%	NA	NA
College	80,986	20.0%	78,145	22.3%	239,693	13.3%
Housewife	31,600	7.8%	14,525	4.1%	150,239	8.4%
Retired	21,067	5.2%	7,980	2.3%	NA	NA
Employed	230,198	56.8%	227,685	64.9%	1,342,491	74.8%
Unemployed	10,128	2.5%	5,918	1.7%	63,081	3.5%
Total	405,134	100.0%	350,974	100.0%	1,795,504	100.0%

Comparison of Occupations
With and Without Persons Under 16 Years of Age
for Rail and Bus Surveys and Boston SMSA (Tables)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
IV-13

As shown in Exhibit IV-14, the proportion of bus riders from households of six or more was over 3-percent smaller than that for the SMSA. Persons from single-member households were almost 7-percent more prevalent in the bus population than the SMSA population.

6. Household Income

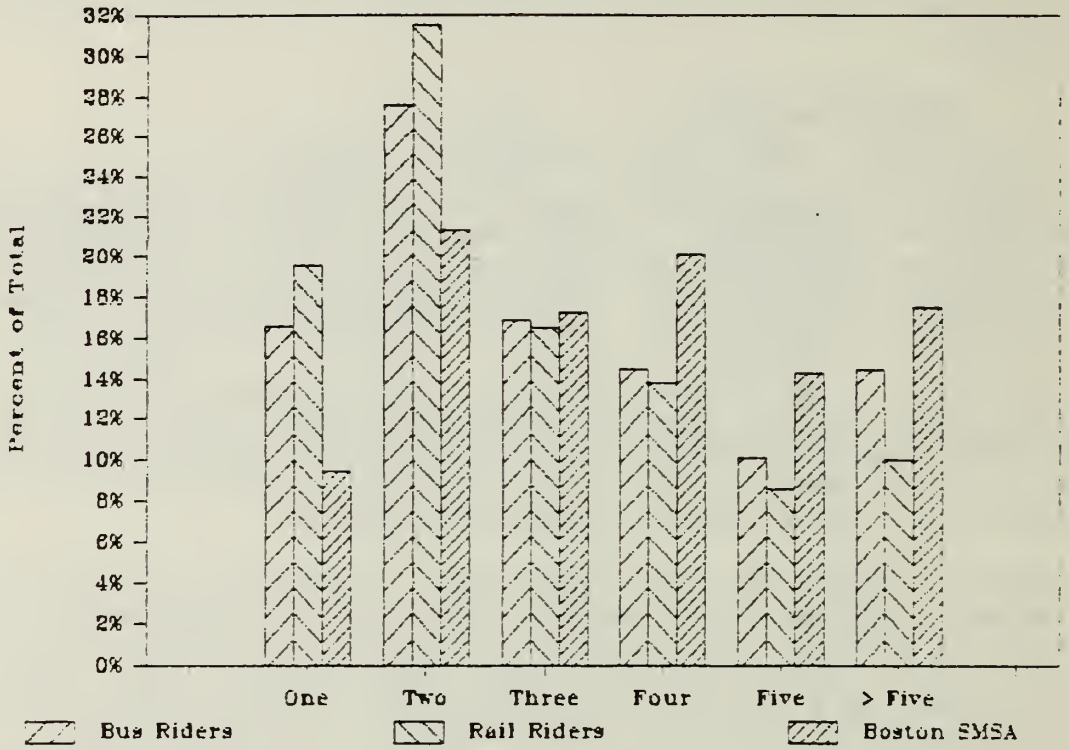
Differences in the opposite ends of the spectrum characterize the comparison of household income for the bus and SMSA populations (see Exhibit IV-15). The proportion of bus riders with incomes greater than $25,000 was less than half as large as that for the general population. At the lower end, the bus riders were more frequently found in the $5,000-$15,000 range.

Distribution of income by route class is presented in Exhibits IV-16 and IV-17. The distributions follow patterns one would have expected. Greater proportions of riders in the lower income brackets are found in the core area, and riders on the commuter lines have larger household incomes.

During analysis of the income data, it became evident that the survey's income ranges should be adjusted. This can be illustrated through consideration of the 1978 federally defined poverty level. For a single person under 65 years old, the level was an income of $3,343 (poverty level in 1979 corrected for inflation using the Consumer Price Index). It was $3,423 for an individual over 65, $5,248 for a family of three, $11,323 for a family of eight. Note that the questionnaire's income ranges are too broad at the lower levels to permit the estimation of persons and families below the poverty line.

Survey designers should keep in mind what the survey results will be used for. Certainly, poverty analysis is important to the MBTA. Title VI Civil Rights compliance reports must be submitted to UMTA periodically. The poverty status of riders is used in the evaluation process, and re-designed data collection would allow a more direct measure than is being used now. The 1978 survey's income ranges are more appropriate for the marketing of consumer products. Income-related analysis other than that of poverty status must be done by the MBTA and must be considered in the survey design, but poverty-status analysis can be better served.

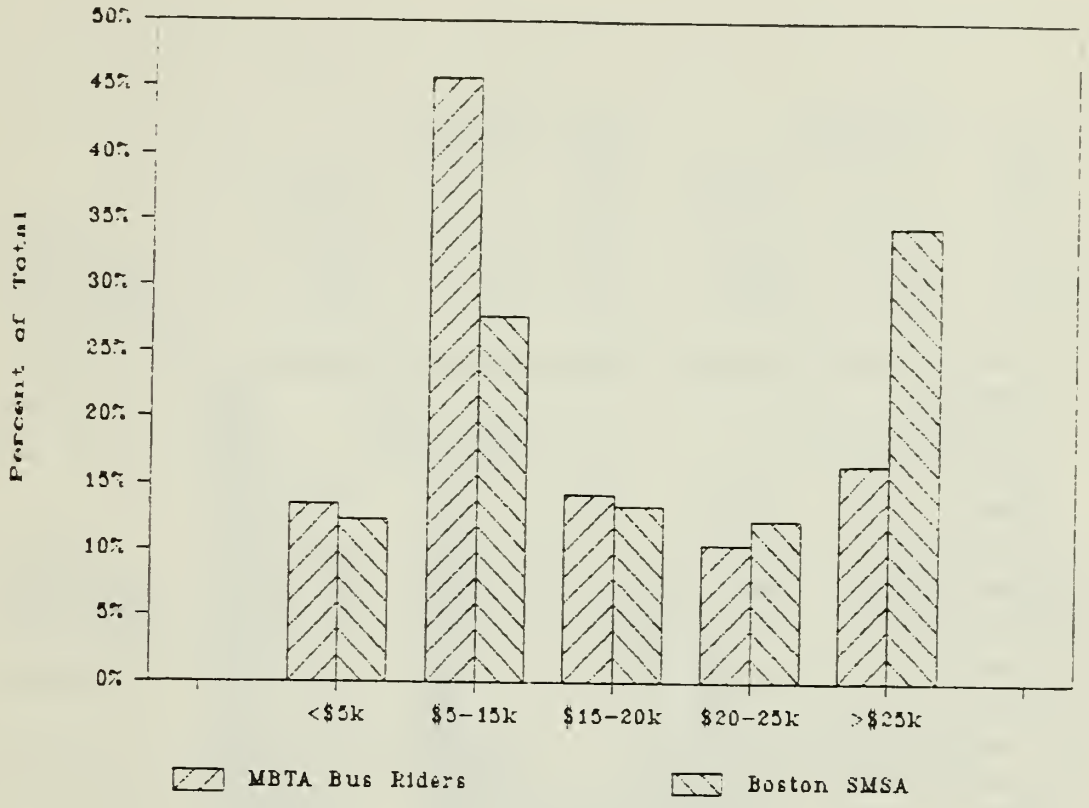
We know that public transit usage is generally inversely proportional to income. It is likely that, at some income level, transit usage becomes relatively insensitive to income. This would suggest that narrower income categories should be defined at the lower end of the survey scale and that the top range could be set at a lower level. Generally, care should be taken to better design the questions on all MBTA survey instruments, particularly through consideration of past experience.



	BUS SURVEY Riders	BUS SURVEY Percent	RAIL SURVEY Riders	RAIL SURVEY Percent	BOSTON SMSA Persons	BOSTON SMSA Percent
One	70,861	16.5%	68,736	19.5%	260,3[illegible]	9.4%
Two	118,429	27.6%	110,853	31.5%	590,920	21.4%
Three	72,148	16.8%	58,107	16.5%	477,603	17.3%
Four	62,111	14.5%	48,698	13.8%	556,004	20.1%
Five	43,452	10.1%	30,443	8.6%	394,710	14.3%
> Five	61,939	14.4%	35,295	10.0%	483,767	17.5%
Total	428,940	100.0%	352,132	100.0%	2,763,357	100.0%

Comparison of Distributions
by Household Size
for the Bus and Rail Surveys and the Boston SMSA
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

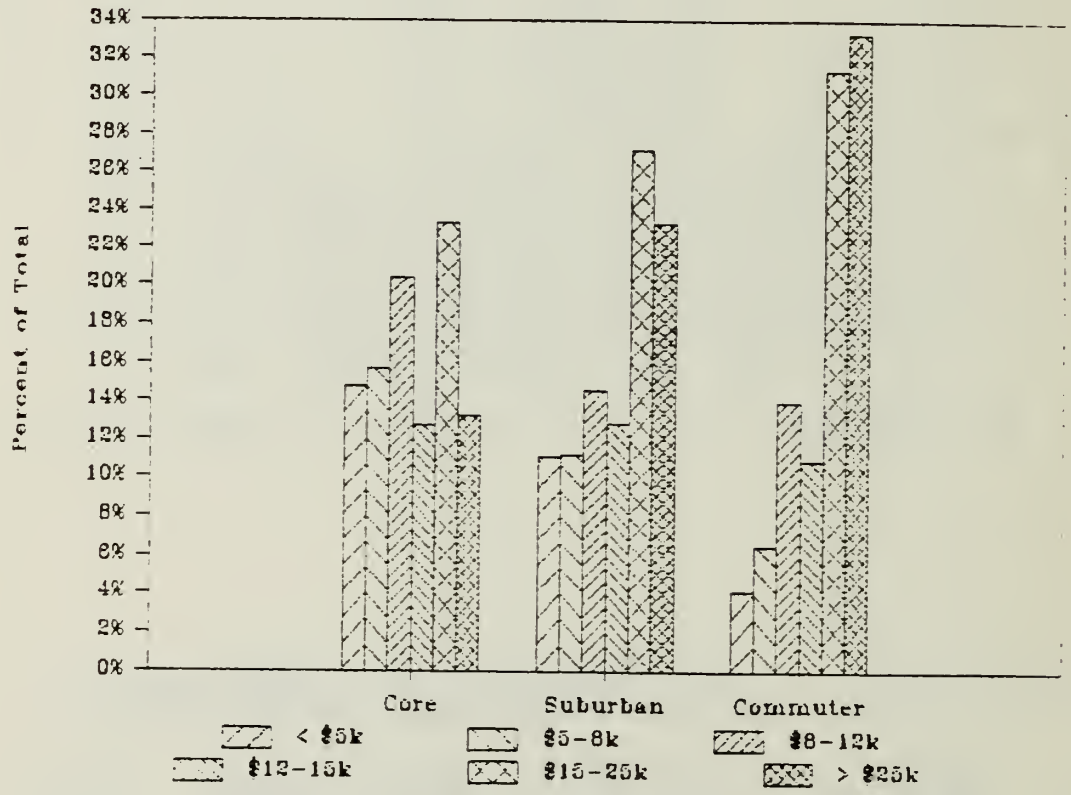
Exhibit
IV-14



	BUS SURVEY Riders	Percent	BOSTON SMSA Hhlds	Percent
<$5,000	57,607	13.4%	121,400	12.3%
$5-15,000	195,725	45.6%	274,430	27.7%
$15-20,000	60,566	14.1%	132,239	13.3%
$20-25,000	44,610	10.4%	121,439	12.3%
>$25,000	70,432	16.4%	340,971	34.4%
Total	428,940	100.0%	990,779	100.0%

Comparison of Distributions
by Household Income
for the Bus Survey and the Boston SMSA
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
IV-15



Distribution of Riders by Household Income by Route Class (Graph)

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit IV-16

	< $5,000			$5-8,000		
	Riders	Income Class Pct	Pct	Riders	Income Class Pct	Pct
Core	46,460	80.7%	14.8%	49,123	80.7%	15.6%
Suburban	10,237	17.8%	11.1%	10,336	17.0%	11.2%
Commuter	910	1.6%	4.1%	1,450	2.4%	6.5%
Total	57,607	100.0%	13.4%	60,909	100.0%	14.2%

	$8-12,000			$12-15,000		
	Riders	Income Class Pct	Pct	Riders	Income Class Pct	Pct
Core	63,950	79.4%	20.3%	40,038	73.7%	12.7%
Suburban	13,462	16.7%	14.6%	11,860	21.8%	12.8%
Commuter	3,100	3.9%	14.0%	2,406	4.4%	10.8%
Total	80,512	100.0%	18.8%	54,304	100.0%	12.7%

	$15-20,000			$20-25,000		
	Riders	Income Class Pct	Pct	Riders	Income Class Pct	Pct
Core	43,123	71.2%	13.7%	30,023	67.3%	9.6%
Suburban	13,785	22.8%	14.9%	11,295	25.3%	12.2%
Commuter	3,658	6.0%	16.5%	3,292	7.4%	14.8%
Total	60,566	100.0%	14.1%	44,610	100.0%	10.4%

	> $25,000			TOTAL		
	Riders	Income Class Pct	Pct	Riders	Income Class Pct	Pct
Core	41,548	59.0%	13.2%	314,265	73.3%	100.0%
Suburban	21,510	30.5%	23.3%	92,485	21.6%	100.0%
Commuter	7,374	10.5%	33.2%	22,190	5.2%	100.0%
Total	70,432	100.0%	16.4%	428,940	100.0%	100.0%

Distribution of Riders by Household Income by Route Class (Table)

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit IV-17

7. Auto Ownership

The likelihood that a bus passenger is from a household that has one automobile is just the same as for the general population (see Exhibit IV-18). The proportions of riders from households with more than one automobile were smaller than those for the SMSA. Auto-less individuals are where the difference is most significant. One-third of all bus passengers did not have an automobile, compared to one-fifth of the general population.

From the 1980 census one can calculate that there were an average of 1.3 autos per household in the Boston SMSA, an increase from the 1970 figure of 1.1. Automobile ownership increased in all corridors. Average auto ownership for households in the bus survey was 1.0, significantly less than in the SMSA. The survey also showed that the majority of bus riders had a driver's license (see Exhibit IV-19).

C. Travel Characteristics of Passengers

The responses to the portion of the questionnaire on travel characteristics are summarized below. A general sketch of systemwide trip-making behavior is first given, and a more detailed discussion of each characteristic follows.

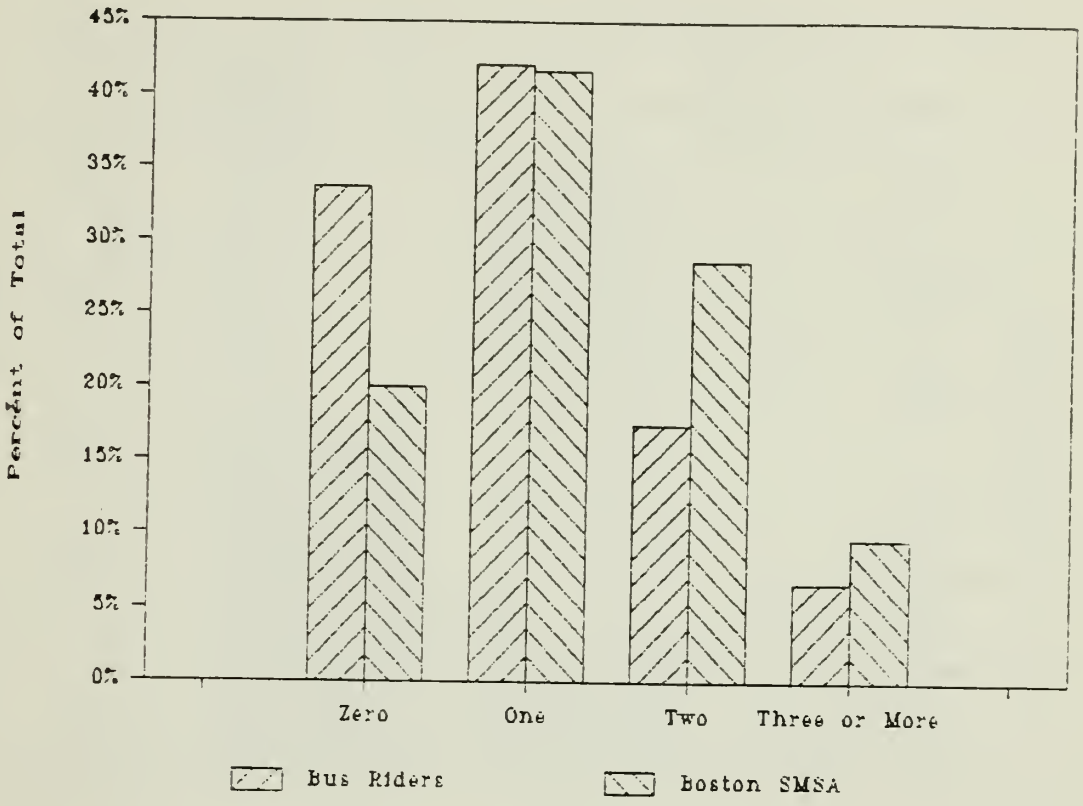
1. Systemwide Summary of Travel Characteristics of Passengers

The systemwide travel characteristics of the bus passengers can be summarized in the following way.

- A little less than one half of all bus trips were for traveling from home to work or back again.
- During the peak periods, greater than six in ten trips were for traveling to or from work.
- During the daytime hours, about two in ten trips were to or from school.
- About seven in ten riders paid Adult Cash Fare. Fewer than one in eight used a prepaid pass.
- Seven in ten passengers walked to the bus to begin their trip.
- Seven in ten walked to their destination after riding the bus. Fewer than two in ten used the rapid transit system after riding the bus.

2. Trip Purpose

Work trips were the dominant purpose for persons using the bus system. Exhibit IV-20 shows the distribution of all riders by

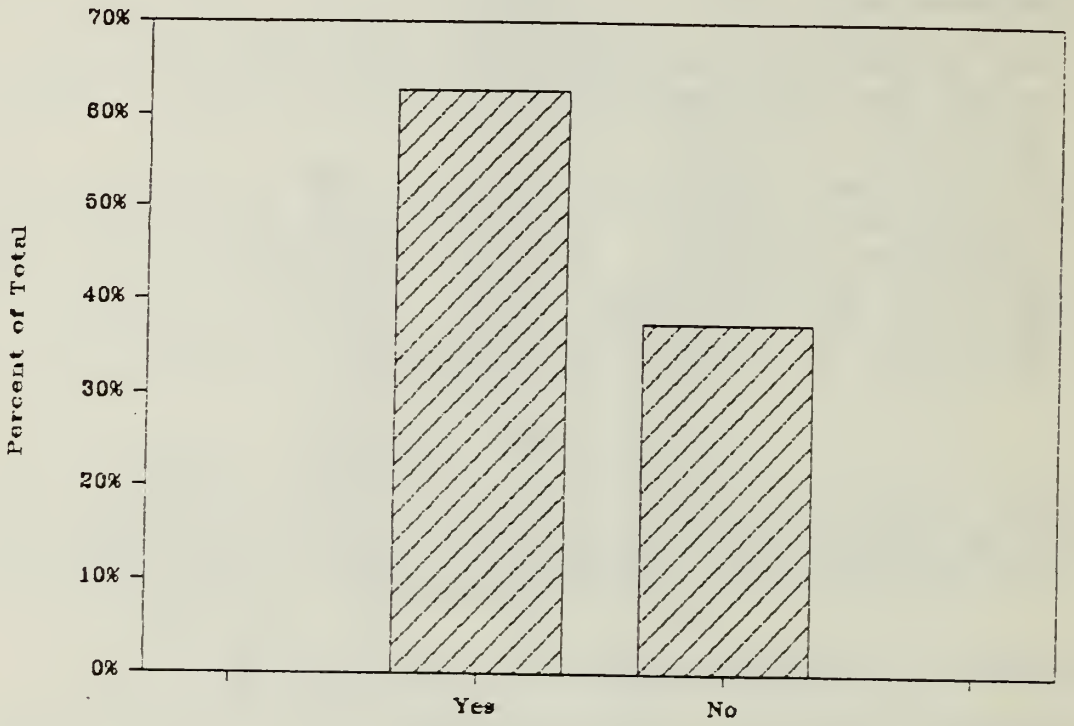


	BUS SURVEY		BOSTON SMSA	
	Riders	Percent	Units	Percent
Zero	144,553	33.7%	199,209	20.1%
One	180,412	42.1%	411,694	41.6%
Two	75,236	17.5%	284,533	28.7%
Three or More	28,739	6.7%	95,224	9.6%
Total	428,940	100.0%	990,660	100.0%

Comparison of Automobile Ownership
between the Bus Survey and the Boston SMSA

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
IV-18

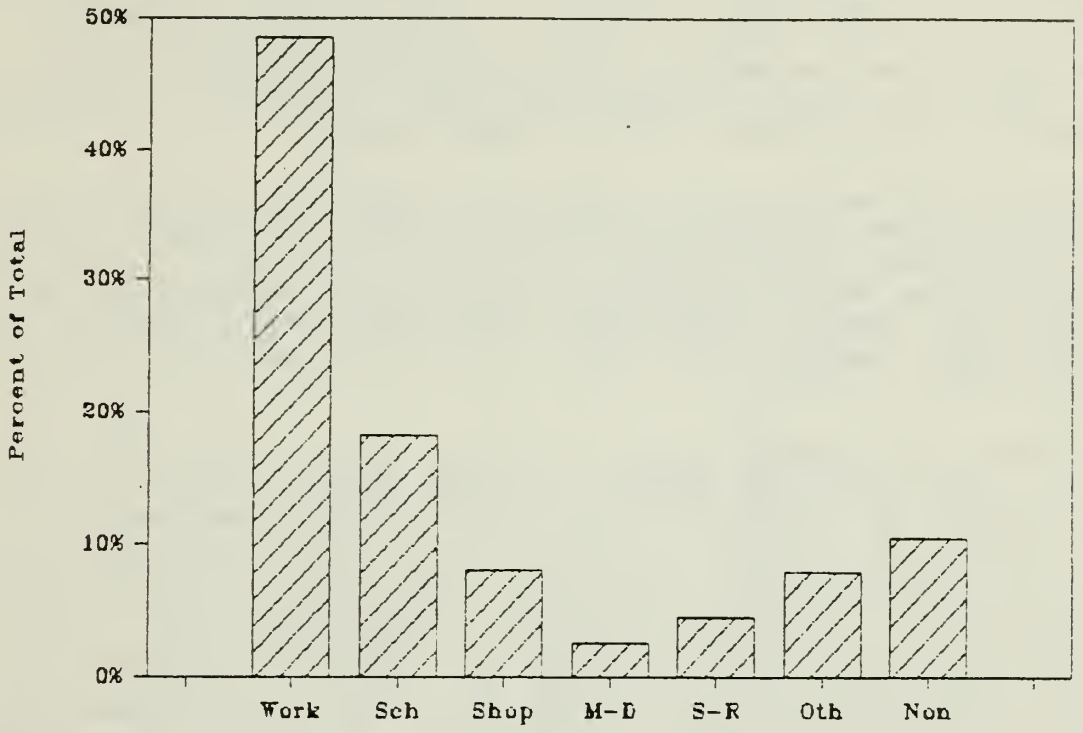


	BUS SURVEY Riders	Percent
Yes	268,345	62.6%
No	160,595	37.4%
Total	428,940	100.0%

Rate of Driver's-License Possession Among Riders

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit IV-19



	Riders	Percent
Home-based Work	207,908	48.5%
Home-based School	78,367	18.3%
Home-based Shop	34,573	8.1%
Home-based Med/Den	10,766	2.5%
Home-based Soc/Rec	18,916	4.4%
Home-based Other	33,672	7.9%
Non-Home-based	44,738	10.4%
Total	428,940	100.0%

Distribution of Riders by Trip Purpose

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit IV-20

trip purpose for the complete composite survey day. Almost 50 percent of the trips were going to or coming from work. Almost 20 percent of the riders were going to or coming from school. Trips for medical or dental visits, shopping and social or recreational reasons made up 15 percent of the total. Other trips that start from the home accounted for another 8 percent. The remaining 10 percent were not home-based.

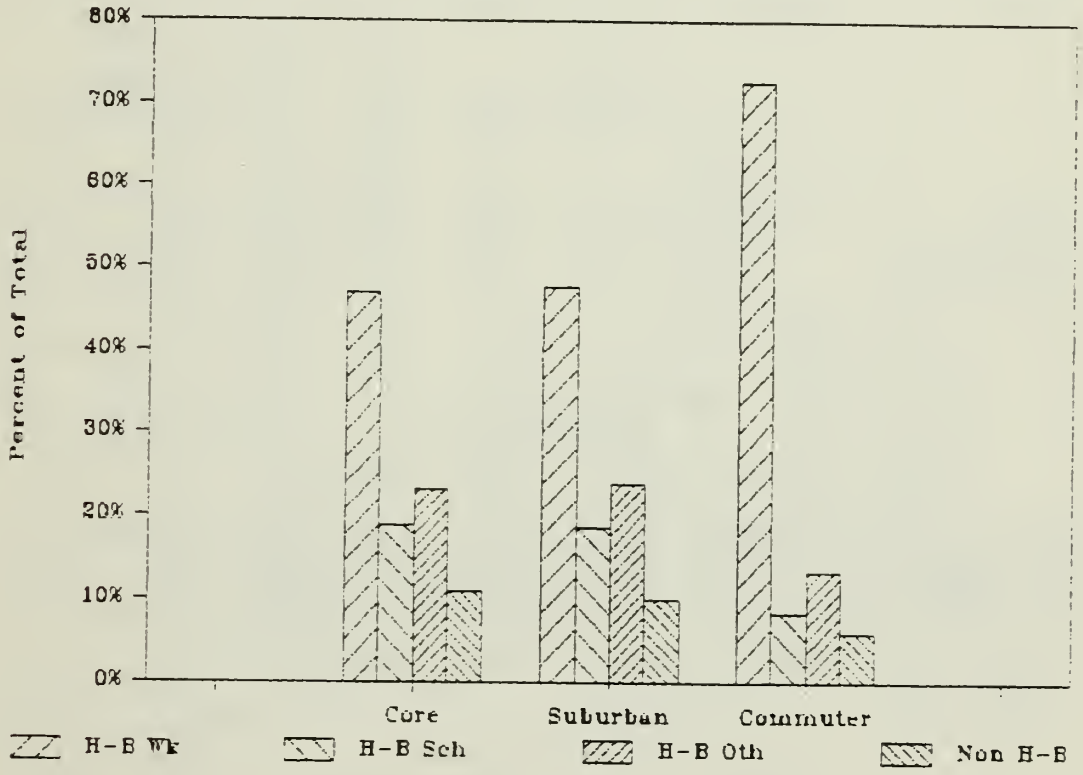
Stratification of trip purposes by class of route confirms expectations (see Exhibits IV-21 and IV-22). The emphasis on work trips holds good no matter where the route runs. Core and suburban routes were not different in their distributions of trip purposes, but commuter (express) routes were dominated even more by work trips. Better than seven out of ten commuter riders used the bus to get to work.

Purposes of travel varied by time of day. Work trips towered over all other purposes during the peak travel periods, as can be seen in Exhibits IV-23 and IV-24, which display purposes for seven periods of the day. A little less than seven out of ten trips in the morning hours were for work travel, while this purpose accounted for a little more than six out of ten in the afternoon peak. The proportion of non-home-based trips, which was not significant in the morning peak period, became appreciable in the late morning and was about two in every ten trips during the period from noon to 4:00 P.M. During the evening peak and the early evening hours, non-home-based trips were about one in every ten.

The relationship of geography and trip purpose is displayed in Exhibits IV-25 and IV-26, which show purpose crosstabulated by garage. The geographic significance of garages is not entirely unambiguous, because a few areas were served by more than one garage. However, this was the most reasonable approach for geographic analysis. The Lynn and Quincy garages had the greatest percentages of work trips. The largest percentage of school trips occurred in the market area of the Cabot Garage. The largest absolute number of school trips was also on Cabot Garage bus routes (about 23,000). The Lynn and Quincy garages had the greatest percentage of shopping trips (about 11 percent). Both of these garages had the lowest percentage of home-based medical and dental trips. Cabot Garage had the largest percentage of non-home-based trips, at 12 percent.

3. Fare-payment Method

Exhibit IV-27 displays the distribution of fares for the complete bus system. The predominant method of fare payment was the adult cash fare. Next in importance was the prepaid pass. Over eight in ten riders used one of these fare payment methods--about seven of these eight used the adult cash fare and the eighth used a pass. On the MBTA rapid-rail system, greater than nine of ten used one of these methods. The bus system has many more



Distribution of Riders by Trip Purpose
by Route Class (Graph)

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
IV-21

	H-B WORK			H-B SCHOOL		
	Riders	Purp Pct	Class Pct	Riders	Purp Pct	Class Pct
Core	146,492	70.5%	47.0%	58,861	75.1%	18.9%
Suburban	44,970	21.6%	47.6%	17,633	22.5%	18.7%
Commuter	16,445	7.9%	72.5%	1,873	2.4%	8.3%
Total	207,907	100.0%	48.5%	78,367	100.0%	18.3%

	H-B SHOP			H-B MED/DEN		
	Riders	Purp Pct	Class Pct	Riders	Purp Pct	Class Pct
Core	24,305	70.3%	7.8%	8,050	74.8%	2.6%
Suburban	9,151	26.5%	9.7%	2,434	22.6%	2.6%
Commuter	1,117	3.2%	4.9%	282	2.6%	1.2%
Total	34,573	100.0%	8.1%	10,766	100.0%	2.5%

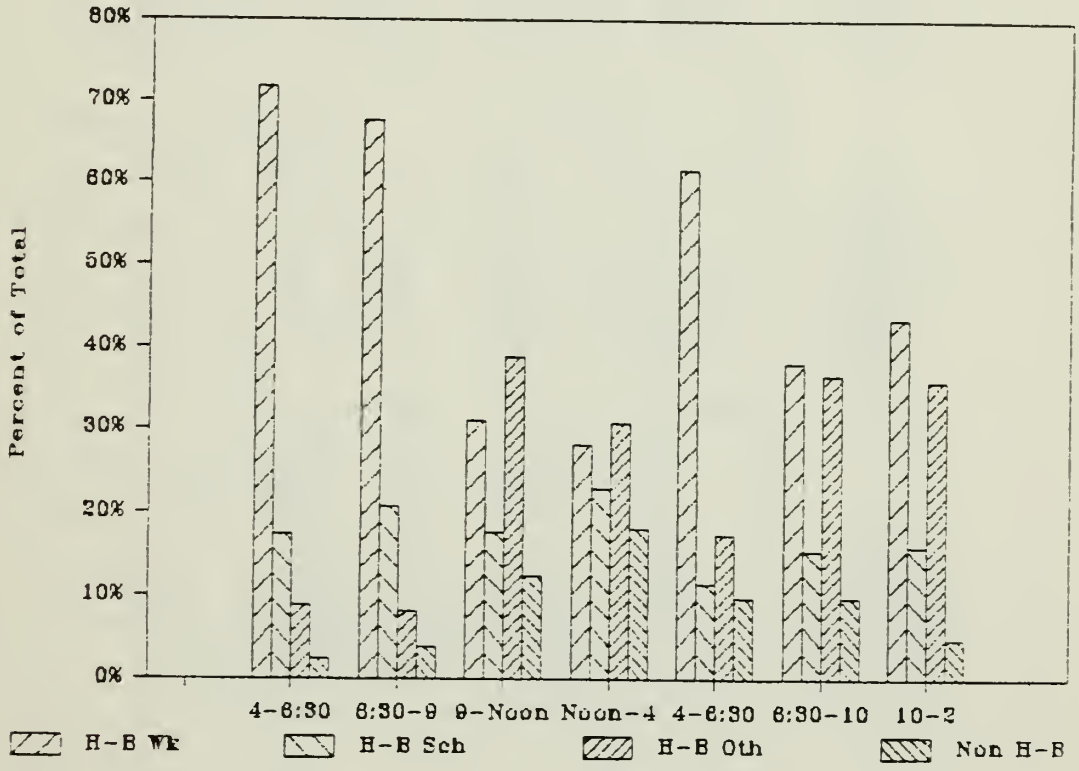
	H-B SOC/REC			OTHER H-B		
	Riders	Purp Pct	Garage Pct	Riders	Purp Pct	Garage Pct
Core	14,669	77.6%	4.7%	25,355	75.3%	8.1%
Suburban	3,757	19.9%	4.0%	7,192	21.4%	7.6%
Commuter	490	2.6%	2.2%	1,125	3.3%	5.0%
Total	18,916	100.0%	4.4%	33,672	100.0%	7.9%

	NON H-B			TOTAL		
	Riders	Purp Pct	Garage Pct	Riders	Purp Pct	Garage Pct
Core	34,063	76.1%	10.9%	311,796	72.7%	100.0%
Suburban	9,319	20.8%	9.9%	94,457	22.0%	100.0%
Commuter	1,356	3.0%	6.0%	22,687	5.3%	100.0%
Total	44,738	100.0%	10.4%	428,940	100.0%	100.0%

Distribution of Riders by Trip Purpose by Route Class (Table)

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit IV-22



Distribution of Riders by Trip Purpose
by Time Period (Graph)

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
IV-23

	H-B WORK			H-B SCHOOL		
	Riders	Purp Pct	Time Pct	Riders	Purp Pct	Time Pct
4-6:30	9,025	4.3%	71.6%	2,194	2.8%	17.4%
6:30-9	74,259	35.7%	67.5%	22,781	29.1%	20.7%
9-Noon	17,634	8.5%	31.2%	9,976	12.7%	17.7%
Noon-4	32,004	15.4%	28.1%	26,222	33.5%	23.0%
4-6:30	59,619	28.7%	61.4%	11,081	14.1%	11.4%
6:30-10	10,855	5.2%	38.1%	4,436	5.7%	15.6%
10-2	4,554	2.2%	43.4%	1,677	2.1%	16.0%
Total	207,950	100.0%	48.5%	78,367	100.0%	18.3%

	H-B SHOP			H-B MED/DEN		
	Riders	Purp Pct	Time Pct	Riders	Purp Pct	Time Pct
4-6:30am	10	.0%	0.1%	136	1.3%	1.1%
6:30-9am	2,565	7.4%	2.3%	1,150	10.7%	1.0%
9am-Noon	10,420	30.1%	18.4%	2,913	27.1%	5.2%
Noon-4pm	14,781	42.8%	13.0%	3,924	36.5%	3.4%
4-6:30pm	4,643	13.4%	4.8%	2,064	19.2%	2.1%
6:30-10pm	1,646	4.8%	5.8%	579	5.4%	2.0%
10pm-2am	508	1.5%	4.8%	0	0.0%	0.0%
Total	34,573	100.0%	8.1%	10,766	100.0%	2.5%

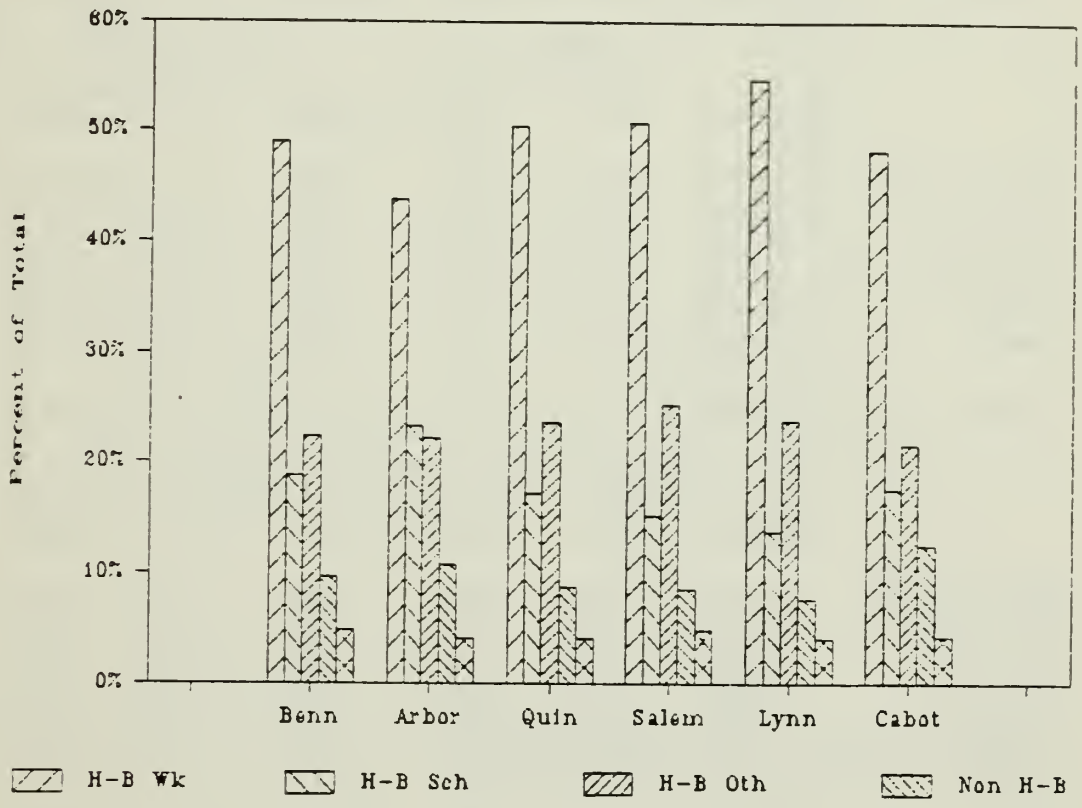
	H-B SOC/REC			OTHER H-B		
	Riders	Purp Pct	Time Pct	Riders	Purp Pct	Time Pct
4-6:30am	70	0.4%	0.6%	881	2.6%	7.0%
6:30-9am	742	3.9%	0.7%	4,419	13.1%	4.0%
9am-Noon	2,160	11.4%	3.8%	6,373	19.0%	11.3%
Noon-4pm	4,767	25.2%	4.2%	11,508	34.2%	10.1%
4-6:30pm	4,112	21.7%	4.2%	6,063	18.0%	6.2%
6:30-10pm	4,525	23.9%	15.9%	3,682	11.0%	12.9%
10pm-2am	2,540	13.4%	24.2%	703	2.1%	6.7%
Total	18,916	100.0%	4.4%	33,629	100.0%	7.8%

	NON H-B			TOTAL		
	Riders	Purp Pct	Time Pct	Riders	Purp Pct	Time Pct
4-6:30am	282	0.6%	2.2%	12,598	2.9%	100.0%
6:30-9am	4,103	9.2%	3.7%	110,018	25.6%	100.0%
9am-Noon	7,037	15.7%	12.5%	56,514	13.2%	100.0%
Noon-4pm	20,556	46.0%	18.1%	113,762	26.5%	100.0%
4-6:30pm	9,467	21.2%	9.8%	97,050	22.6%	100.0%
6:30-10pm	2,787	6.2%	9.8%	28,510	6.6%	100.0%
10pm-2am	506	1.1%	4.8%	10,488	2.4%	100.0%
Total	44,738	100.0%	10.4%	428,940	100.0%	100.0%

Distribution of Riders by Trip Purpose by Time Period (Table)

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit IV-24



Distribution of Riders by Trip Purpose
by Garage (Graph)

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
IV-25

	H-B WORK			H-B SCHOOL		
	Riders	Purp Pct	Garage Pct	Riders	Purp Pct	Garage Pct
Bennett St	40,218	19.3%	49.1%	15,431	19.7%	18.8%
Arborway	35,643	17.1%	43.9%	18,934	24.2%	23.3%
Quincy	12,311	5.9%	50.4%	4,216	5.4%	17.3%
Salem St	40,904	19.7%	50.8%	12,272	15.7%	15.2%
Lynn	11,229	5.4%	54.7%	2,829	3.6%	13.8%
Cabot	67,645	32.5%	48.2%	24,685	31.5%	17.6%
Total	207,950	100.0%	48.5%	78,367	100.0%	18.3%

	H-B SHOP			H-B MED/DEN		
	Riders	Purp Pct	Garage Pct	Riders	Purp Pct	Garage Pct
Bennett St	6,721	19.4%	8.2%	2,277	21.2%	2.8%
Arborway	5,981	17.3%	7.4%	1,937	18.0%	2.4%
Quincy	2,482	7.2%	10.2%	510	4.7%	2.1%
Salem St	7,492	21.7%	9.3%	2,261	21.0%	2.8%
Lynn	2,078	6.0%	10.1%	444	4.1%	2.2%
Cabot	9,819	28.4%	7.0%	3,337	31.0%	2.4%
Total	34,573	100.0%	8.1%	10,766	100.0%	2.5%

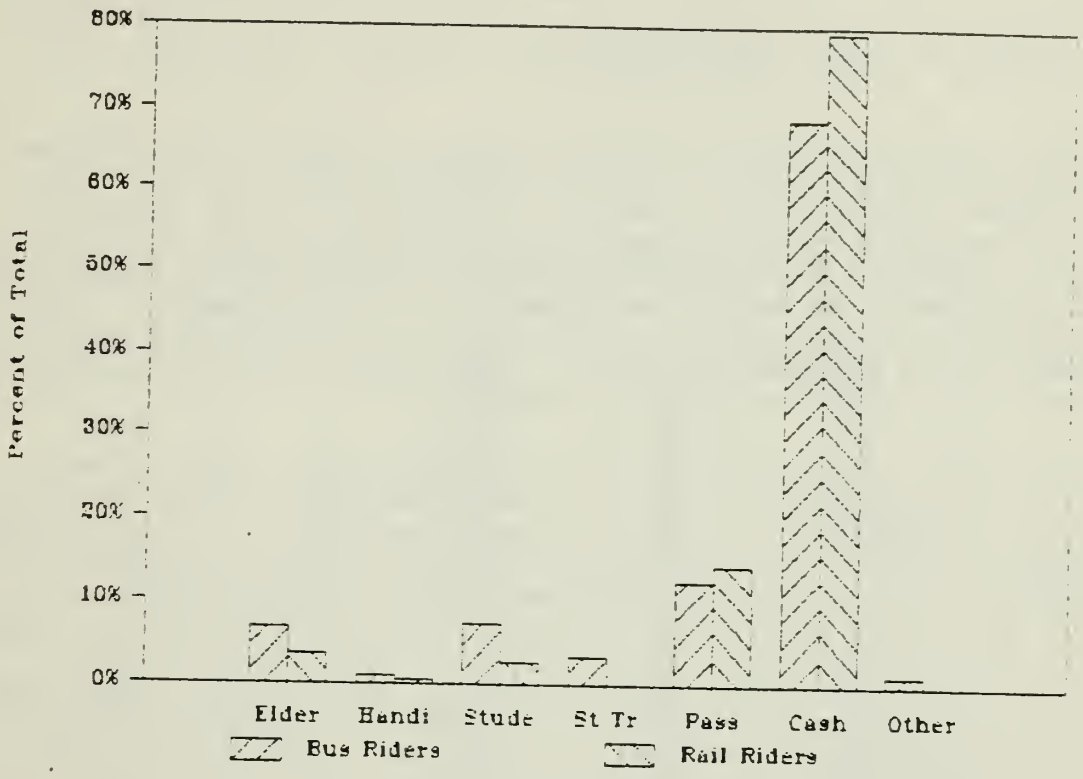
	H-B SOC/REC			OTHER H-B		
	Riders	Purp Pct	Garage Pct	Riders	Purp Pct	Garage Pct
Bennett St	3,925	20.8%	4.8%	5,434	16.2%	6.6%
Arborway	3,341	17.7%	4.1%	6,759	20.1%	8.3%
Quincy	997	5.3%	4.1%	1,789	5.3%	7.3%
Salem St	3,859	20.4%	4.8%	6,780	20.2%	8.4%
Lynn	853	4.5%	4.2%	1,523	4.5%	7.4%
Cabot	5,941	31.4%	4.2%	11,344	33.7%	8.1%
Total	18,916	100.0%	4.4%	33,629	100.0%	7.8%

	NON H-B			TOTAL		
	Riders	Purp Pct	Garage Pct	Riders	Purp Pct	Garage Pct
Bennett St	7,941	17.8%	9.7%	81,948	19.1%	100.0%
Arborway	8,684	19.4%	10.7%	81,278	18.9%	100.0%
Quincy	2,121	4.7%	8.7%	24,426	5.7%	100.0%
Salem St	6,943	15.5%	8.6%	80,511	18.8%	100.0%
Lynn	1,575	3.5%	7.7%	20,531	4.8%	100.0%
Cabot	17,474	39.1%	12.5%	140,246	32.7%	100.0%
Total	44,738	100.0%	10.4%	428,940	100.0%	100.0%

Distribution of Riders by Trip Purpose by Garage (Table)

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit IV-26



	BUS SURVEY Riders	BUS SURVEY Percent	RAIL SURVEY Riders	RAIL SURVEY Percent
Elderly	28,825	6.7%	12,439	3.5%
Handicapped	3,560	0.8%	1,265	0.4%
Student	30,240	7.1%	9,032	2.5%
Student Transfer	14,327	3.3%	0	0.0%
Pass	53,103	12.4%	51,060	14.4%
Adult Cash	294,381	68.6%	281,836	79.2%
Other	4,504	1.1%	0	0.0%
Total	428,940	100.0%	355,632	100.0%

Distribution of Riders by Fare Paid

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit IV-27

riders in the alternate fare-payment categories than the rail system, while total numbers of adult-cash-fare riders differ by little more than 4 percent and pass users by less than 4 percent. The bus system has more than twice as many elderly-fare riders, three times as many handicapped-fare riders, and almost five times as many student-fare riders.

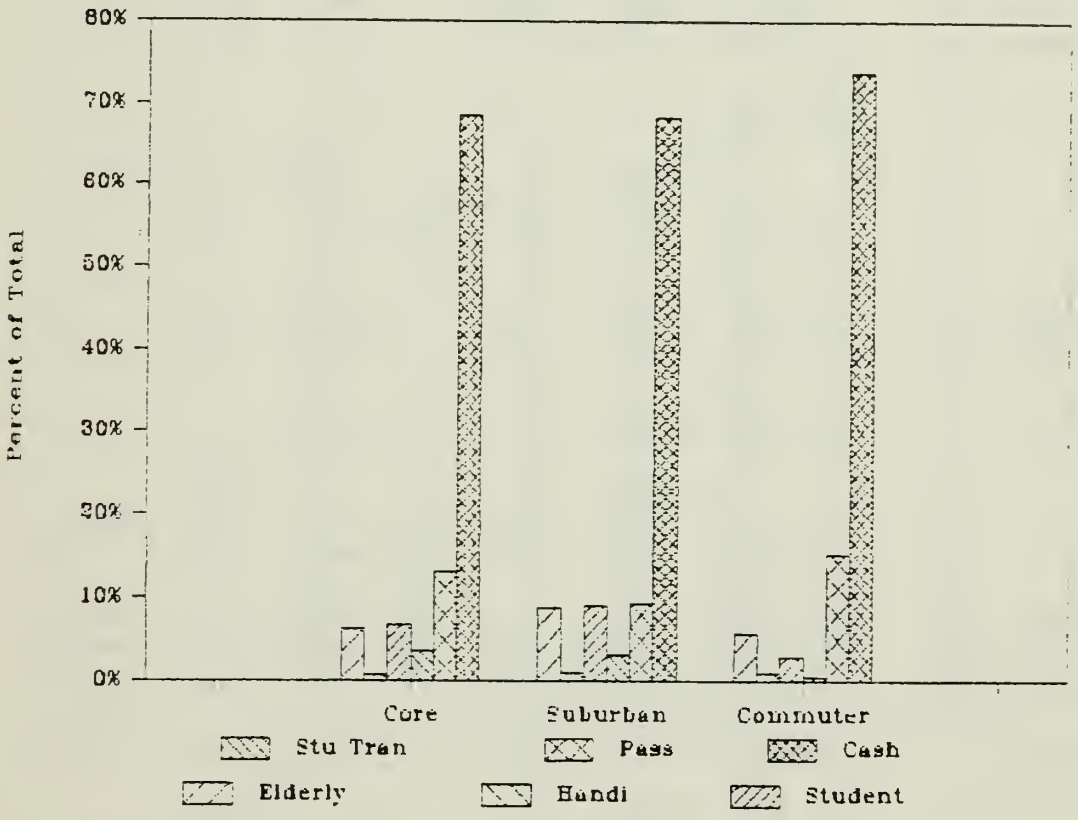
Examination of the fare categories by class of route (see Exhibits IV-28 and IV-29) reveals several interesting points. The greatest percentage of elderly ridership was on suburban routes. Handicapped fares were the same proportion on all route classes. Students were proportionally most numerous on suburban routes and least, as would be expected, on the commuter routes. Pass usage was proportionally greatest on the commuter routes and smallest on the suburban routes. Adult cash fares were most predominant among commuter-route passengers.

No unusual patterns seem to be evident when fare payment method is examined by time of day (see Exhibits IV-30 and IV-31). Elderly and handicapped riders traveled mainly in the hours between the peak periods. It is interesting that elderly persons made up 15 percent of the ridership between 9:00 A.M. and 12:00 noon. Student fares were paid most often in the morning peak and from noon to 4:00 P.M., and it seems likely that such trips were clustered about the usual school-closing times within the latter period. The adult cash fare was the method of payment used most frequently from 10:00 P.M. until 2:00 A.M. (eight out of ten fares). It was used least frequently from noon until 4:00 P.M. (six out of ten).

4. Frequency of Usage

Two questions were asked of each rider surveyed about frequency of use of the bus system, the first about absolute frequency (see Exhibit IV-32) and the second about change in frequency of use over the previous two years. Almost half the riders traveled four or five times in a week. Another one in four riders traveled six or more times a week. Thus, the overwhelming majority of riders used the system more than four times per week (defined as four days per week, with a two-way trip each day). More than half the riders felt that their use had increased (see Exhibit IV-33). Almost four in ten thought that it had remained the same. Fewer than one in ten thought that their usage had decreased.

Frequency of use by purpose is presented in Exhibits IV-34 and IV-35. Almost six in ten passengers who were using the bus to travel from home to work or back used the bus four or five times a week. One quarter of these riders used it six or more times per week. As has been noticed, about half of all bus trips are work trips. School trips showed a similar frequency of utilization. The remaining trip-purpose types were more evenly distributed over the usage-rate categories, though, for most, the



Distribution of Riders by Fare Paid
by Route Class (Graph)

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
IV-28

	ELDERLY			HANDICAPPED		
	Riders	Fare Pct	Class Pct	Riders	Fare Pct	Class Pct
Core	19,258	66.8%	6.2%	2,435	68.4%	0.8%
Suburban	8,293	28.8%	8.8%	904	25.4%	1.0%
Commuter	1,274	4.4%	5.7%	221	6.2%	1.0%
Total	28,825	100.0%	6.7%	3,560	100.0%	0.8%

	STUDENT			STUDENT TRANSFER		
	Riders	Fare Pct	Class Pct	Riders	Fare Pct	Class Pct
Core	21,071	69.7%	6.8%	11,413	79.7%	3.7%
Suburban	8,540	28.2%	9.0%	2,802	19.6%	3.0%
Commuter	629	2.1%	2.8%	112	0.8%	0.5%
Total	30,240	100.0%	7.1%	14,327	100.0%	3.3%

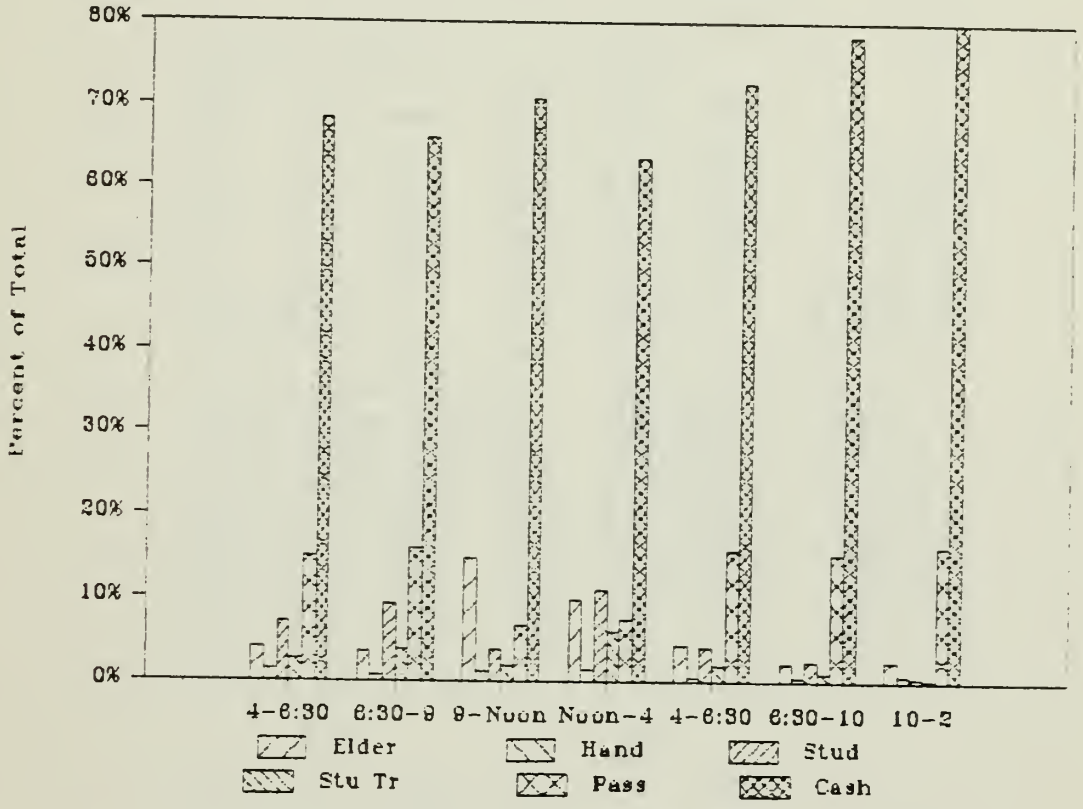
	PASS			CASH		
	Riders	Fare Pct	Class Pct	Riders	Fare Pct	Class Pct
Core	40,869	77.0%	13.1%	213,280	72.5%	68.4%
Suburban	8,804	16.6%	9.3%	64,587	21.9%	68.2%
Commuter	3,430	6.5%	15.3%	16,515	5.6%	73.8%
Total	53,103	100.0%	12.4%	294,382	100.0%	68.6%

	OTHER			TOTAL		
	Riders	Fare Pct	Class Pct	Riders	Fare Pct	Class Pct
Core	3,490	77.5%	1.1%	311,813	72.7%	100.0%
Suburban	803	17.8%	0.8%	94,735	22.1%	100.0%
Commuter	211	4.7%	0.9%	22,392	5.2%	100.0%
Total	4,504	100.0%	1.1%	428,940	100.0%	100.0%

Distribution of Riders by Fare Paid by Route Class (Table)

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit IV-29



Distribution of Riders by Fare Paid
by Time Period (Graph)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
IV-30

	ELDERLY			HANDICAPPED		
	Riders	Fare Pct	Time Pct	Riders	Fare Pct	Time Pct
4-6:30am	513	1.8%	4.1%	177	5.0%	1.4%
6:30-9am	3,984	13.8%	3.6%	649	18.2%	0.6%
9am-Noon	8,397	29.1%	14.7%	684	19.2%	1.2%
Noon-4pm	10,996	38.2%	9.7%	1,431	40.2%	1.3%
4-6:30pm	4,110	14.3%	4.3%	431	12.1%	0.5%
6:30-10pm	574	2.0%	2.0%	108	3.0%	0.4%
10pm-2am	251	0.9%	2.4%	80	2.2%	0.8%
Total	28,825	100.0%	6.7%	3,560	100.0%	0.8%

	STUDENT			STUDENT TRANSFER		
	Riders	Fare Pct	Time Pct	Riders	Fare Pct	Time Pct
4-6:30am	889	2.9%	7.0%	331	2.3%	2.6%
6:30-9am	10,351	34.2%	9.3%	4,295	30.0%	3.9%
9am-Noon	2,208	7.3%	3.9%	1,021	7.1%	1.8%
Noon-4pm	12,305	40.7%	10.9%	6,691	46.7%	5.9%
4-6:30pm	3,774	12.5%	3.9%	1,698	11.9%	1.8%
6:30-10pm	674	2.2%	2.3%	281	2.0%	1.0%
10pm-2am	39	0.1%	0.4%	10	0.1%	0.1%
Total	30,240	100.0%	7.1%	14,327	100.0%	3.3%

	PASS			CASH		
	Riders	Fare Pct	Time Pct	Riders	Fare Pct	Time Pct
4-6:30am	1,896	3.6%	15.0%	8,625	2.9%	68.1%
6:30-9am	17,853	33.6%	16.0%	73,301	24.9%	65.8%
9am-Noon	3,845	7.2%	6.7%	40,419	13.7%	70.7%
Noon-4pm	8,348	15.7%	7.4%	71,859	24.4%	63.6%
4-6:30pm	15,134	28.5%	13.8%	69,415	23.6%	72.6%
6:30-10pm	4,354	8.2%	15.2%	22,491	7.6%	78.4%
10pm-2am	1,673	3.2%	16.2%	8,272	2.8%	79.9%
Total	53,103	100.0%	12.4%	294,382	100.0%	68.6%

	OTHER			TOTAL		
	Riders	Fare Pct	Time Pct	Riders	Fare Pct	Time Pct
4-6:30am	230	5.1%	1.8%	12,662	3.0%	100.0%
6:30-9am	960	21.3%	0.9%	111,393	26.0%	100.0%
9am-Noon	580	12.9%	1.0%	57,153	13.3%	100.0%
Noon-4pm	1,423	31.6%	1.3%	113,051	26.4%	100.0%
4-6:30pm	1,065	23.6%	1.1%	95,628	22.3%	100.0%
6:30-10pm	218	4.9%	0.8%	28,701	6.7%	100.0%
10pm-2am	28	0.6%	0.3%	10,353	2.4%	100.0%
Total	4,504	100.0%	1.1%	428,940	100.0%	100.0%

Distribution of Riders by Fare Paid
by Time Period (Table)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
IV-31

Frequency	Riders	Percent
0 or 1 per Week	55,762	13.0%
2 or 3 per Week	64,899	15.1%
4 or 5 per Week	202,888	47.3%
6 or More per Week	105,391	24.6%
Total	428,940	100.0%

Distribution of Riders by Frequency of Bus Use (Table)

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

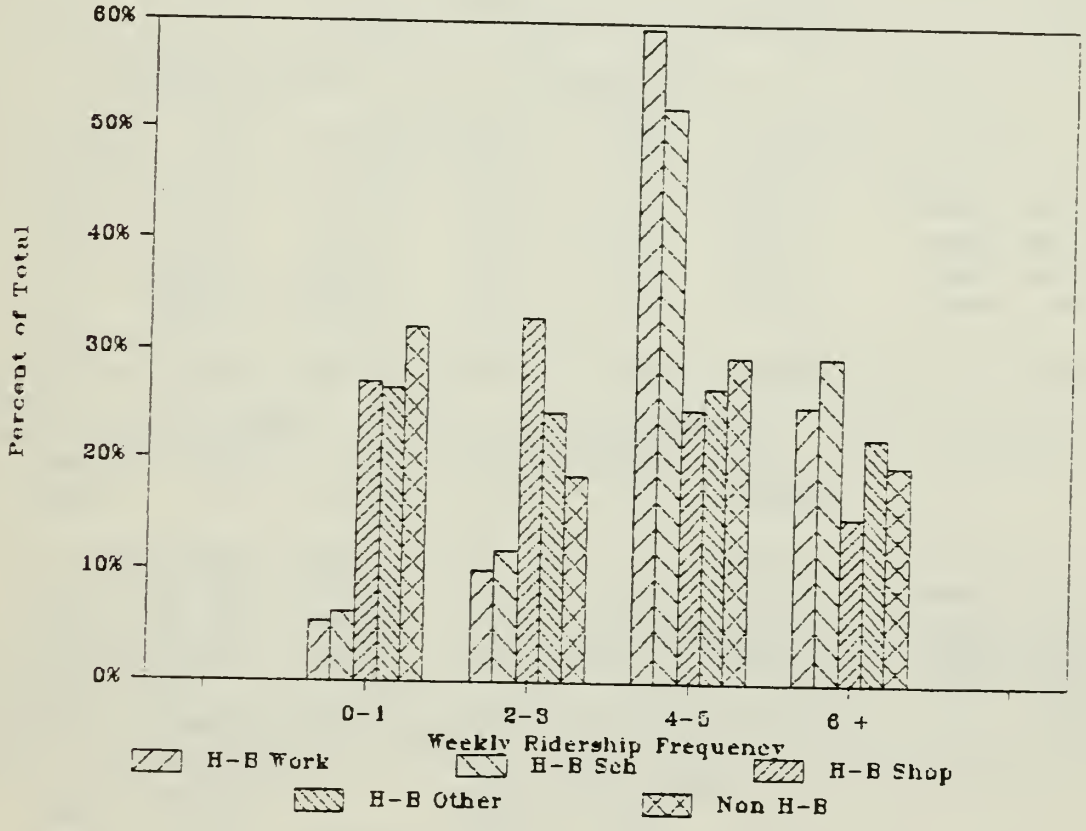
Exhibit IV-32

Change	Riders	Percent
Increase	232,872	54.3%
Decrease	30,712	7.2%
Same	165,356	38.6%
Total	428,940	100.0%

Distribution of Riders by Change in Frequency of Bus Use

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit IV-33



Distribution of Riders by Frequency of Bus Use
by Trip Purpose (Graph)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
IV-34

	H-B WORK			H-B SCHOOL		
	Riders	Purp Pct	Freq Pct	Riders	Purp Pct	Freq Pct
0-1 per Week	11,463	5.4%	20.6%	4,863	6.2%	8.7%
2-3 per Week	21,313	10.0%	32.9%	9,205	11.8%	14.2%
4-5 per Week	126,287	59.5%	61.7%	40,777	52.3%	19.9%
6+ per Week	53,219	25.1%	51.3%	23,093	29.6%	22.3%
Total	212,282	100.0%	49.5%	77,938	100.0%	18.2%

	H-B SHOP			H-B MED/DEN		
	Riders	Purp Pct	Freq Pct	Riders	Purp Pct	Freq Pct
0-1 per Week	9,348	27.1%	16.8%	3,641	35.1%	6.5%
2-3 per Week	11,363	33.0%	17.5%	2,801	27.0%	4.3%
4-5 per Week	8,535	24.8%	4.2%	2,221	21.4%	1.1%
6+ per Week	5,198	15.1%	5.0%	1,717	16.5%	1.7%
Total	34,444	100.0%	8.0%	10,380	100.0%	2.4%

	H-B SOC/REC			OTHER H-B		
	Riders	Purp Pct	Freq Pct	Riders	Purp Pct	Freq Pct
0-1 per Week	4,947	26.4%	8.9%	7,604	23.9%	13.6%
2-3 per Week	5,311	28.3%	8.2%	6,719	21.1%	10.4%
4-5 per Week	4,324	23.1%	2.1%	9,783	30.7%	4.8%
6+ per Week	4,163	22.2%	4.0%	7,721	24.3%	7.4%
Total	18,745	100.0%	4.4%	31,827	100.0%	7.4%

	NON H-B			TOTAL		
	Riders	Purp Pct	Freq Pct	Riders	Purp Pct	Freq Pct
0-1 per Week	13,895	32.1%	24.9%	55,761	13.0%	100.0%
2-3 per Week	8,045	18.6%	12.4%	64,757	15.1%	100.0%
4-5 per Week	12,815	29.6%	6.3%	204,742	47.7%	100.0%
6+ per Week	8,568	19.8%	8.3%	103,680	24.2%	100.0%
Total	43,323	100.0%	10.1%	428,940	100.0%	100.0%

Distribution of Riders by Frequency of Bus Use by Trip Purpose (Table)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit IV-35

majority of persons were in the lower-usage categories. This would make sense since these purposes are more elective in nature. Crosstabulation of frequency of use and route class is displayed in Exhibits IV-36 and IV-37.

5. Mode of Access

People generally either walked to the bus or accessed it via subway or a streetcar; no other modes of access were used with any great frequency. Exhibit IV-38 charts mode of access for all bus passengers. The vast majority (seven in ten) walked to the bus. One quarter gained access by use of the rapid-rail services of the MBTA. The percentage of bus riders who used a private automobile for access (1.5%) was less than one-sixth as large as that of rapid-rail MBTA riders. Access using a taxi was about the same for both portions of the MBTA in terms of percentage. Commuter rail ("train" in exhibits) riders transferred to buses about half as frequently as to rail rapid transit. Crosstabulation of route type by access mode is shown in Exhibits IV-39 and IV-40.

6. Mode of Egress

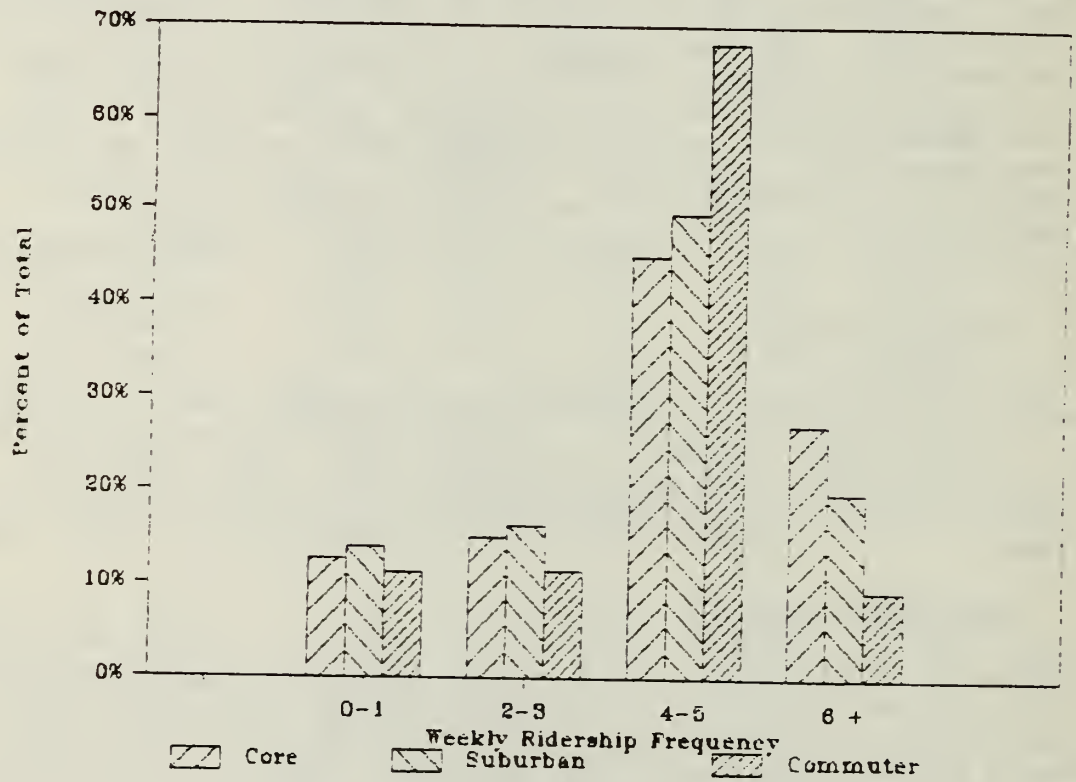
After taking the bus, the majority of riders (seven out of ten) walked (see Exhibit IV-41). Others (almost one out of four) changed to streetcar, subway, or another bus. The remaining modes of egress were used by a total of less than 5 percent of the riders. These breakdowns are very similar to those for mode of access.

7. Bus/Rail Analysis

A measure of the number of trips made using both bus and rail rapid transit is valuable in in station design for the bus/rail interface and in estimating the percentage of the market that mixed-mode monthly-pass sales are tapping. Several factors prevented the estimation of these trips from the rail-survey data, but it is now possible to estimate them using the bus survey.

Comparison of access mode and egress mode for bus riders shows close correspondence in the absolute numbers of people coming from or going to the rail-rapid-transit system. The difference of only about 3 percent leads one to speculate that the bus/rail riders are the same people as the rail/bus riders, but it could be a coincidence. If it is not, bus/rail ridership was indicated to be about 67,000 by the bus-survey results and about 83,000 by the rail results. The better techniques used to expand the bus results and certain difficulties with the expanded rail results lends more confidence to the former figure.

Combination-mode riders of the MBTA bus and rapid-rail systems make up 18 percent of all rail riders and 16 percent of



Distribution of Riders by Frequency of Bus Use by Route Class (Graph)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

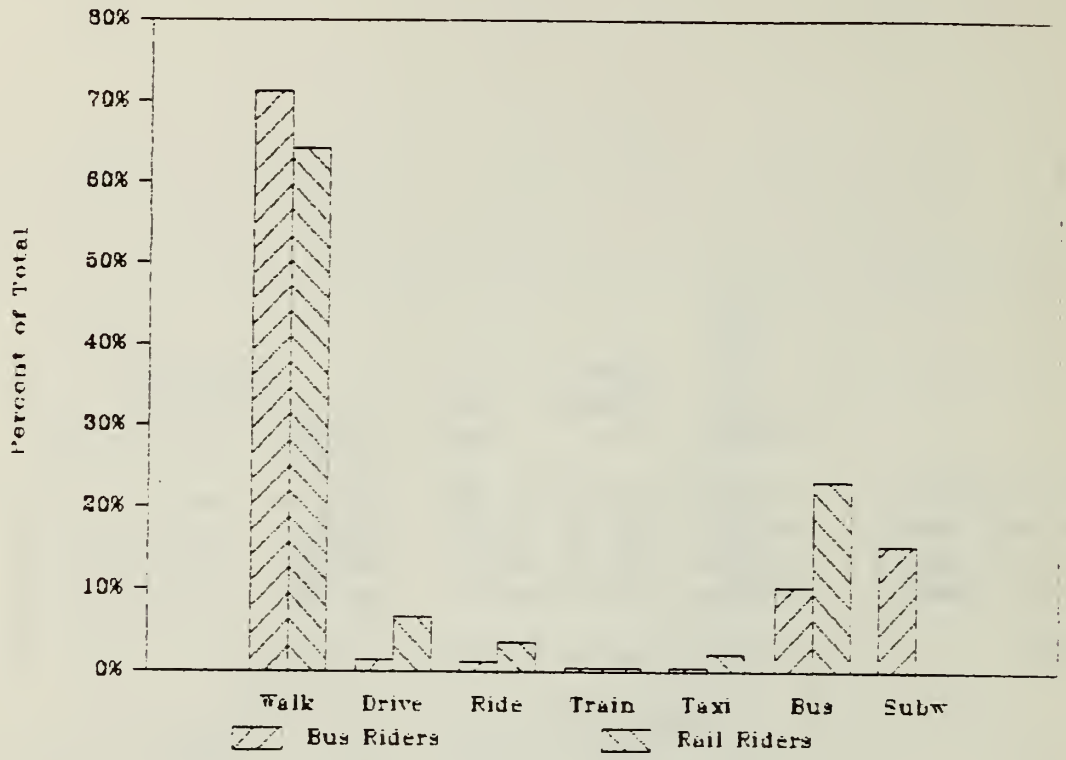
Exhibit IV-36

	CORE			SUBURBAN		
	Riders	Class Pct	Freq Pct	Riders	Class Pct	Freq Pct
0-1 per Week	40,081	12.8%	71.8%	13,204	14.0%	23.7%
2-3 per Week	46,891	15.0%	72.2%	15,443	16.4%	23.8%
4-5 per Week	140,859	45.1%	69.4%	46,697	49.6%	23.0%
6+ per Week	84,566	27.1%	80.2%	18,765	19.9%	17.8%
Total	312,397	100.0%	72.8%	94,109	100.0%	21.9%

	COMMUTER			TOTAL		
	Riders	Class Pct	Freq Pct	Riders	Class Pct	Freq Pct
0-1 per Week	2,509	11.2%	4.5%	55,793	13.0%	100.0%
2-3 per Week	2,571	11.5%	4.0%	64,905	15.1%	100.0%
4-5 per Week	15,264	68.0%	7.5%	202,821	47.3%	100.0%
6+ per Week	2,090	9.3%	2.0%	105,421	24.6%	100.0%
Total	22,434	100.0%	5.2%	428,940	100.0%	100.0%

Distribution of Riders by Frequency of Bus Use by Route Class (Table)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit IV-37

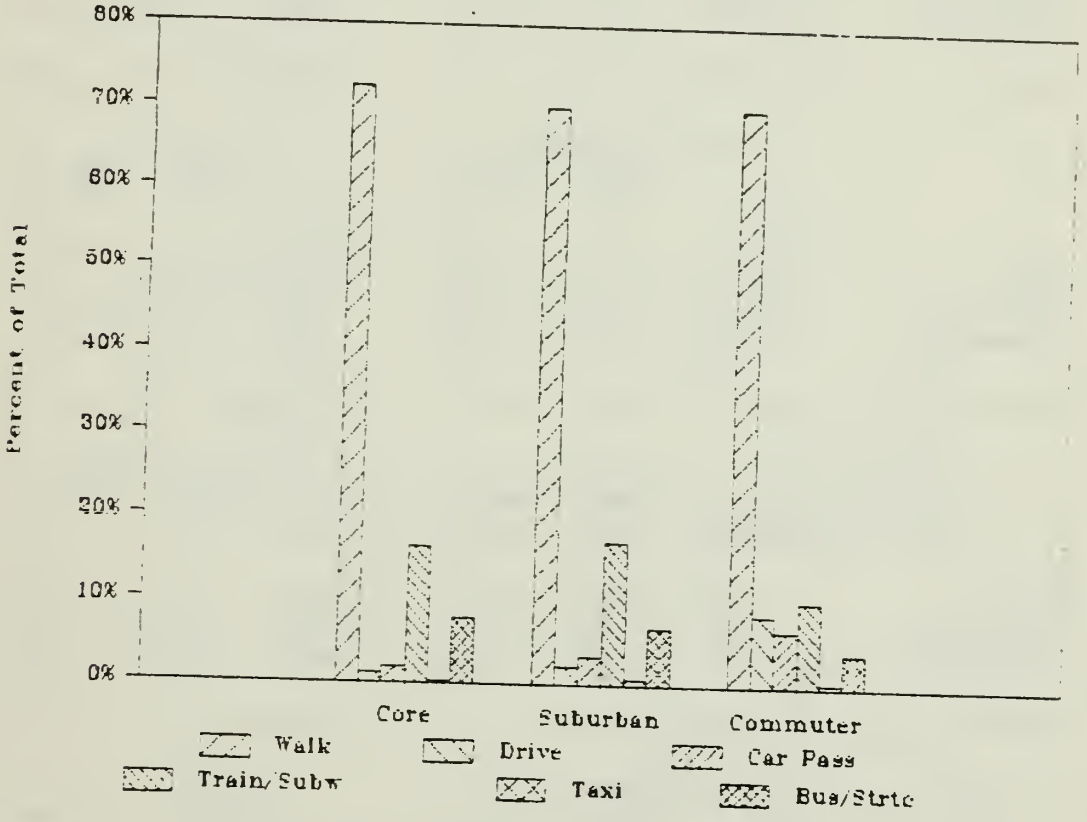


	BUS SURVEY Riders	BUS SURVEY Percent	RAIL SURVEY Riders	RAIL SURVEY Percent
Walk	305,148	71.1%	232,056	64.2%
Drive Car	6,177	1.4%	23,714	6.6%
Ride Car	4,547	1.1%	13,117	3.6%
Train	2,188	0.5%	1,251	0.3%
Taxi	1,501	0.4%	7,558	2.1%
Bus or Streetcar	43,923	10.2%	83,451	23.1%
Subway	65,456	15.3%	129	.0%
Total	428,940	100.0%	361,276	100.0%

Comparison of Distribution of Riders by Mode of Access
Bus and Rail Surveys

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit IV-38



Distribution of Riders by Mode of Access by Route Class (Graph)

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit IV-39

	WALK			DRIVE CAR		
	Riders	Mode Pct	Class Pct	Riders	Mode Pct	Class Pct
Core	225,831	73.5%	72.3%	3,816	49.7%	1.2%
Suburban	65,862	21.4%	69.9%	1,923	25.1%	2.0%
Commuter	15,643	5.1%	70.0%	1,939	25.3%	8.7%
Total	307,336	100.0%	71.7%	7,678	100.0%	1.8%

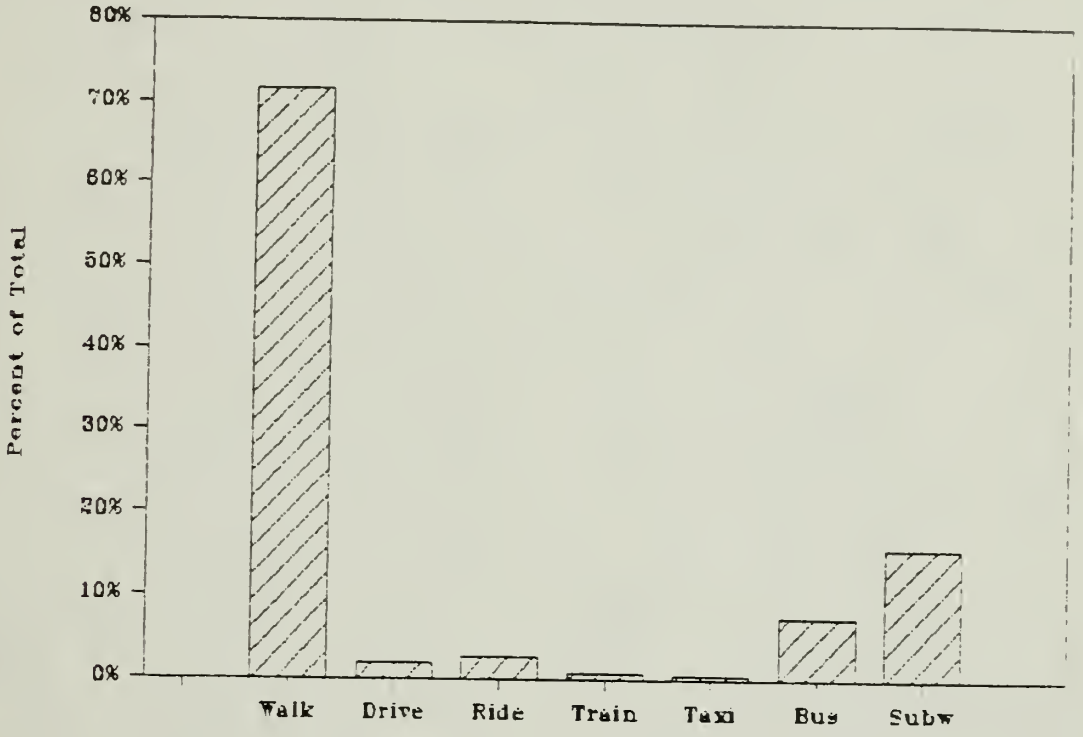
	CAR PASSENGER			TRAIN		
	Riders	Mode Pct	Class Pct	Riders	Mode Pct	Class Pct
Core	6,052	57.1%	1.9%	2,052	82.5%	0.7%
Suburban	3,072	29.0%	3.3%	365	14.7%	0.4%
Commuter	1,471	13.9%	6.6%	71	2.9%	0.3%
Total	10,595	100.0%	2.5%	2,488	100.0%	0.6%

	TAXI			BUS OR STREETCAR		
	Riders	Mode Pct	Class Pct	Riders	Mode Pct	Class Pct
Core	778	50.4%	0.2%	24,219	76.6%	7.8%
Suburban	661	42.8%	0.7%	6,515	20.6%	6.9%
Commuter	105	6.8%	0.5%	879	2.8%	3.9%
Total	1,544	100.0%	0.4%	31,613	100.0%	7.4%

	SUBWAY			TOTAL		
	Riders	Mode Pct	Class Pct	Riders	Mode Pct	Class Pct
Core	49,682	73.4%	15.9%	312,429	72.8%	100.0%
Suburban	15,778	23.3%	16.8%	94,177	22.0%	100.0%
Commuter	2,227	3.3%	10.0%	22,334	5.2%	100.0%
Total	67,687	100.0%	15.8%	428,940	100.0%	100.0%

Distribution of Riders by Mode of Access
by Route Class (Table)
MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit
IV-40



	Riders	Percent
Walk	307,335	71.7%
Drive Car	7,678	1.8%
Ride Car	10,595	2.5%
Train	2,488	0.6%
Taxi	1,544	0.4%
Bus/Streetcar	31,613	7.4%
Subway	67,687	15.8%
Total	428,940	100.0%

Distribution of Riders by Mode of Egress

MBTA BUS PASSENGER DATA COLLECTION PROGRAM

Exhibit IV-41

all bus riders. These are aggregate levels and do not represent the composition of riders at particular rapid transit stations. For example, bus/rail riders are, no doubt, a greater portion of total riders at stations with considerable bus activity, such as Wellington Station, than at other stations on the same line, such as Community College.